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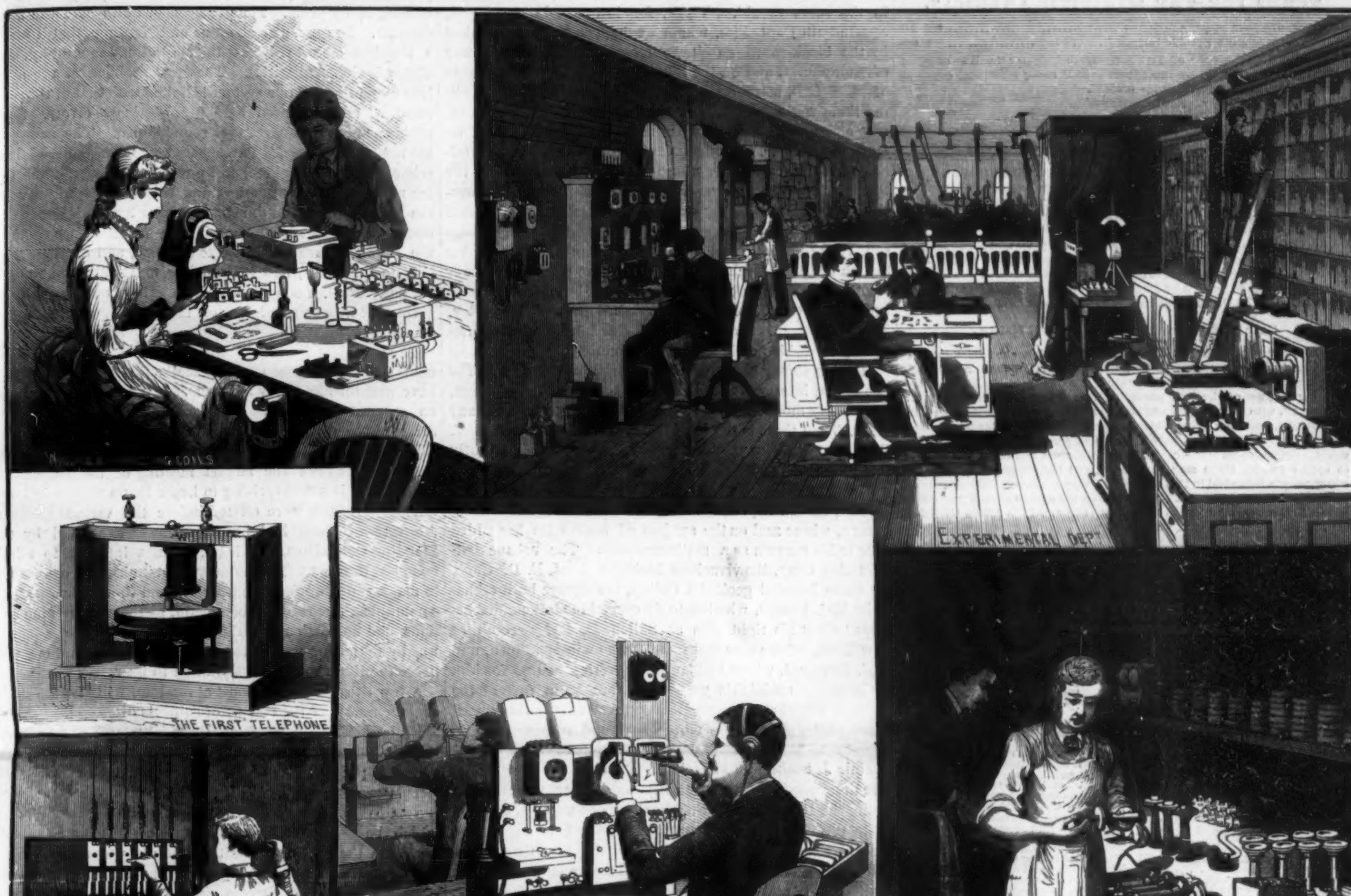

ILLUSTRATIONS OF THE AMERICAN BELL TELEPHONE.—[See page 180.]

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Contents.

(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 455,

For the Week ending September 20, 1884.

Price 10 cents. For sale by all newsdealers.

MORE ABOUT THE A. A. A. S.

To begin with, what a good thing it would be for our scientists to choose some shorter name for their annual gathering! "The American Association for the Advancement of Science" is too long for common use, while its abbreviated form, A. A. A. S., seems almost disrespectful. Why might not the term "Scientific Congress" be substituted, as being at once dignified and handy?

A passing word as to the *personnel* of the one or two thousand scientists convened from all parts of this and other lands. Few of them are

"Sicklied o'er with the pale cast o' thought."

They look as if they enjoyed life all the better for having grown familiar with nature. Scientists are by no means run in the same mould. There, for instance, is the jovial, square built Capt. Pim, whom we happened to see flanked by the black-robed Jesuit, Professor Perry, the astronomer of Stonyhurst, and on the other side was the robust figure of R. S. Ball, astronomer royal of Ireland, while overlooking them was a son of Anak, six feet ten inches in height, who contrasted strangely with the short, slight shape of an Oxford professor. Much distinction is accorded to Dr. Dollinger, the microscopist, whose masterly refutation of the theory of spontaneous generation made a profound impression. Prof. Mulhall, the eminent statistician, has an Irish face full of shrewdness and humor; while Sir Wm. Thomson, though born in Ireland, betrays his origin by a strong Scotch brogue. Trelawney Saunders is another conspicuous foreigner, whose researches into Biblical geography have been quite remarkable. The graybeard poet of Barnesley, Thomas Lister, is another marked character, and a favorite by reason of his poetic tributes to America.

Mention should also be made of American scientists. The genial and intelligent face of the secretary, Prof. Putnam, is probably more familiar to the scientific public than any other. Then there is the bright, vivacious astronomer, Prof. C. A. Young, who presided last year, and the tall, slightly stooping figure of Prof. J. P. Lesley, the present president; and wholly unlike either is Prof. H. A. Newton, of Yale College, chosen to preside next year, a thin-visaged but kindly man, whose zeal on the subject of meteorites has added fame to his renown as a mathematician. The urbane botanist Asa Gray, the vivacious biologist Prof. E. D. Cope, the white bearded geologist Collett, the square built ethnologist Maj. Powell, who has to do everything left handed because he lost his right arm at Shiloh, Prof. Newcomb of New York, whose face and fame are so widely known, and Prof. Rowland, whose brilliant discoveries secured for him the Rumford medal this year—these are but a few of the scientific stars in this constellation. And among the women of science there are those whose zeal and perseverance in research have been remarkable. Everybody knows Mrs. Erminie J. Smith and Miss Alice Fletcher, both of whom have done good work practically as well as scientifically among the Indians. Miss Fletcher has been very ill, and still has to use canes to get about. Her escort is an Omaha named La Flesche, who exhibited for the first time the sacred pipes of his nation. Mrs. Mary Treat, a lady of marked intellectuality and energy, has made a specialty of spiders, and has also given much attention to insectivorous plants. Miss Grace Anna Lewis, on the other hand, is a successful ornithologist, and Miss Adele M. Field, a missionary to China, has an enviable reputation as an ichthyologist, besides having published a Swatoo dictionary.

The Academy of Music was filled with probably as intellectual an audience as was ever gathered in America, to hear the speeches of welcome and response and Professor C. A. Young's annual address as the retiring president. His theme was "Pending Problems in Astronomy," with an historical introduction. The fact was stated that exactly thirty-six years ago the American Association for the Advancement of Science was organized near its present place of meeting, and now for the first time revisits its honored birthplace. Few of the leaders of that movement remain. A new generation has arisen. But the influence of the society has extended widely in transforming the world of thought and altering the aspects of material life. The telegraph and dynamo have changed the conditions of business and industry, and the speculations of Darwin and Helmholtz have affected those of philosophy and science until one might say "all things have become new." Passing to his especial theme, Professor Young stated certain astronomical problems that he regarded as urgently demanding solution. An impression prevails that we already know the dimensions of the earth accurately; and yet it is not so, except so far as geodetic triangulations have been possible. Astronomical determinations of latitude and longitude do not meet the case. They give only the direction of gravity, and no linear measurement. We have no means of determining exactly the relative position of places separated by oceans. Nor do we know just what sort of spheroid the earth is; for every new continental survey calls for some fresh modification. A more important question is as to the uniformity of the earth's rotation on its axis, and as to the manner and extent of its variations. Only of late have we begun to suspect our unit of time and of length. Plainly any changes in the earth's form must change the length of the day; and there is reason to suspect that the earth's rotational motion is irregular, and consequently our time reckoning is wrong and a new unit will shortly be demanded. Can a unit be found that shall be free from local considerations and equally applicable wherever physical action pervades the universe? Another problem relates to the constancy of the position of the earth's axis in the globe. Other problems relate to the rigidity of the earth, its internal constitution and temperature.

The moon also sets us problems, as to her orbital action, surface, heat, and atmosphere. The difficulties in the way are some of them purely mathematical, and progress must be slow and painful. Others are physical, and grow out of contradictory observations. In the planetary system we meet with the same problems, in the main, that relate to the moon. It is our duty to continue to search for asteroids. There are signs pointing to the existence of a great world beyond the remotest of the present planetary family. Mercury, Mars, Venus, and Jupiter, each offers enigmas for us to explain. The red spot on the latter has disappeared after baffling us for years. The problems of Saturn are still more difficult. So remote are Uranus and Neptune that it seems a hopeless task to discuss their rotation, topography, and atmospheric peculiarities. The great problem of the absolute dimensions of our system is linked with that of the solar parallax, and obscured by many obstinate errors. Solar problems of great interest yet remain open. The sun-spots are not yet explained. The peculiar rotation, equatorial acceleration, chromosphere, and prominences, etc., of the sun are receiving much attention, and this is especially true of the maintenance and duration of solar heat. Meteors and comets furnish a crowd of problems; and when we come to the stars they are multiplied to myriads, and for their solution new methods, new instruments, must aid human observations. Prof. Young closed by a eulogy of astronomy as giving the human mind its most invigorating and ennobling exercise.

The president for this year is Prof. J. P. Lesley, the eminent geologist, whose untiring zeal and excellent qualities have won for him many admirers. It is to be regretted that on account of illness he was unable to preside, and had to delegate the duty to Prof. E. D. Cope, one of the vice-presidents.

As this has been the largest meeting of the Association ever held, it is not surprising to know that a relatively large number of papers were offered before the various sections. Abstracts of these had been previously examined by the Standing Committee, and it is no doubt intended to admit none but the best. Yet the most casual observer cannot fail to note a wide difference in the value and thoroughness of the communications read. Then again, as there were nine sections, and no particular strictness in limiting discussion, it was by no means easy to keep the run of them, and one was liable to miss what he most wanted to hear.

A few titles, selected almost at random, will give the reader some notion of the classes of subjects discussed.

Prof. J. E. Hilgard, Supt. United States Coast Survey, read a paper on "The Relative Level of the Atlantic Ocean and Gulf of Mexico, with Remarks on the Gulf Stream and Deep Sea Temperature." He exhibited a relief model of the sea bottom underlying the waters described, by means of which he showed that the true continental outline differs from the accidental limit of land and water. The West Indies are but mountains rising from a great submarine plateau. The Gulf Stream, caused by trade winds, flows out of the Gulf of Mexico as from a sort of reservoir, or accumulator, and is higher than the surrounding ocean. As to the depths of the sea, Prof. Hilgard held that their low temperature is not due to the polar currents, but to the molecular constitution of the water itself, whose maximum density is always characterized by a certain temperature, which for fresh water is 39° and for sea water is 35°. The temperature of the Gulf is 37° at a depth of 1,000 fathoms.

Prof. J. B. Martin, of England, gave an interesting paper on the "Future of the United States," in which he discussed free trade, the sources of wealth, the status of American science, literature, and politics, offering many agreeable compliments and a few keen criticisms.

The "Sensitiveness of the Eye" was the theme on which Prof. E. L. Nichols, of Lawrence, Kansas, spoke, showing by a series of experiments that the power to perceive colors of low saturation depends on the delicacy of the eye itself, while the ability to detect variations of shading results from practice.

The problems as to the education and proper care of the deaf and dumb were treated of severally by Profs. Chickering, Gordon, and Bell, whose array of statistics was startling to prove that by massing mutes together in schools and asylums we were actually raising up a race of mutes. The remedy is to teach them to speak, and to scatter them among speaking children. That is Prof. Bell's theory. But others regard it as visionary and impracticable. The silent people are a class by themselves.

The Geodetic Survey, with an account of the immense system of triangulation now being carried on in the United States, was ably described by Prof. J. H. Gore, who reports 10,522 triangulation stations as having been occupied, 183 established for azimuth, 296 for latitude, 110 for telegraphic longitude, and 664 for magnetic observations; and fifteen bases have been accurately measured.

The Anthropological Section is always attractive, modern savants never seeming to tire of discussing the prehistoric peoples. Prof. F. W. Putnam graphically described recent explorations he has made in Western mounds, with maps and drawings. Mr. P. R. Hoy explained the manner in which the Indians made their stone implements. The rage for such relics is such that factories are now in operation for their production by white people, and not less than 2,000 stone axes have been made in Philadelphia alone during the past

year. These are sent out West to be "discovered," and then sold to innocent collectors! Major Powell spoke on the mythology of the Wintuns of the valley of the Sacramento.

New Jersey is not a large State, but it has done some remarkably thorough geological work, as was explained by Prof. G. H. Cook, State geologist. The secret of it is that special attention has from the first been given to practical and obviously useful matters, and consequently the survey has met with popular approval.

One of the most instructive of the evening lectures was by Prof. R. S. Ball, astronomer royal of Ireland, on the methods of measuring distances between the stars. It was beautifully illustrated by lantern slides, and his clear, resonant voice made it an agreeable task to listen.

As might be imagined, some of the papers read provoked discussions, and sometimes matters become unpleasant. This was particularly so in the case of Mr. F. Cope Whitehouse of New York, whose paper two years ago to prove that Fingal's Cave was artificial will be remembered. This year he had an elaborate address on the Pyramids, to prove that those immense structures were built from the top downward. After considerable difficulty he gained a hearing in the Academy of Music, though the Standing Committee took pains to disavow connection with the singular paper. Mr. Whitehouse is really an indefatigable investigator, and for his own sake we could wish that, for a while at least, he might be content to employ his remarkable gifts in a more useful manner than by trying to establish such very odd fancies.

All things considered, this may be set down as the most successful meeting of the kind ever held on this continent, and when the members dispersed after their week's labors and enjoyments, it was with the general feeling that they had been abundantly paid for their pilgrimage to the City of Brotherly Love.

FOR THE ADVANCEMENT OF SCIENCE.

There are said to be in existence, in this and other lands, two thousand scientific societies. Some of these are devoted to special departments of investigation, while others aim to foster all branches of learning; some again are exclusive, being limited to a few individuals of ripe attainments, while others are more popular in their constitution, and aim at assembling into one organization all the scientific men of a State or nation. Hand-books have been issued giving the names of both American and European scientific bodies, and also, as far as practicable, a list of scientists in all parts of the world, with a brief statement of the specialty of each. So vast a directory must unavoidably be characterized by some errors and omissions; yet the immediate result is gained of bringing men of learning into fellowship with each other. And the same end is still more effectually secured by the two great popular associations, the British and American, each avowing its aim to be "for the Advancement of Science." These bodies have met recently, the one in Montreal and the other in Philadelphia; in each case a large number of the sister society attending.

Under the circumstances it is interesting to recall the earlier times, when, instead of being welcomed and feasted and applauded, scientific societies were ridiculed, accused, and persecuted. The Royal Society was organized in London in 1620, and had a long fight for existence. It is said that many of its members were so poor as to be unable to pay the subscription rate of a shilling a week. Among those excused from this tax was Isaac Newton, who in 1686, laid before the Royal Society the original manuscript of his famous "Principia." Sir John Hill actually wrote a quarto volume to set forth the crimes, heresies, and conspiracies of that illustrious body, and physicians, clergymen, and fellows of the universities joined in the hue and cry. Moved by similar jealousy, King James I. dissolved the Society of Antiquaries. Even within the last quarter of a century, ignorant men who somehow had gained influence used it to pour contempt on savants whom the whole world now delights to honor! The last decade has seen an extraordinary improvement especially in the attitude of the devotees of science and religion toward each other; and it seems to be mutually agreed that the problems before men's minds can only be solved by allowing the largest liberty of thought and expression, due respect being paid meanwhile to the convictions of conscience and the intuitions of faith, which have a province of their own. This has been made conspicuous more than ever this year, in the public addresses delivered both at Montreal and Philadelphia. The attitude of the leading men of these great scientific associations is generally reverential, and the fact should be known and appreciated by the religious public.

The British Association has existed about fifty-four years, and the American thirty-three; and while in general aim and plan they closely resemble each other, yet there are points of difference. Each has its general sessions and its sections devoted to special departments. But, besides this, the British Association has not less than forty practically permanent committees pursuing definite objects from year to year, and making annual reports of progress; *e.g.*, a committee on meteors, on underground temperature, on lunar disturbance of gravity, on patent laws, on the rate of wages, on the migration of birds etc. We heartily second the suggestion, made already by *Science*, that this feature should be incorporated in the methods of the American Association, promising as it does the achievement of riper results than are within reach of inexpert and haphazard amateurs, who rove from field to field, hoping to gather spoils amid mines or stars, icebergs or ocean depths, atoms or antiquities, as the case may be. Of course there are in this country scientists who are wisely following for successive years clearly marked paths of investigation; but they would be stimulated by recognition, financial aid, and occasional advice from the Association, such as now they seldom receive. Possibly the British delegates felt called on to do their best in consideration of the fact that they were on new soil; but the above suffices to explain the admitted superiority and greater thoroughness of their papers and addresses as compared with our own. We may well imitate their good example.

The growing demand for an International Scientific Congress makes it all the more necessary that liberal financial aid should be furnished, in order to further the aims and improve the methods of special scientific research. A noble step in the right direction has been taken by Mrs. Elizabeth Thompson, of Stamford, Conn. She gave $1,000 at the opening of the recent session of the American Association, to be applied to experiments as to light and heat. This is her second gift in that direction. She has also offered $10,000 more, provided others will contribute an equal amount, the interest of which is to be used in promoting special scientific study.

Two special trains left Montreal on Sept. 4, one containing 300 British scientists bound for Philadelphia, and the other 250 more *en route* for the Rocky Mountains. To Capt. Bedford Pim belongs the honor of originating the movement for the British Association to meet this year in Montreal.

The idea was at first regarded as impracticable, and it was thought that not more than a hundred would go. But fully six times that number responded to the invitation of the Canadian metropolis. Capt. Pim is now enthusiastic in urging the American Association to hold its meeting for 1886 in London, and has telegraphed to the Lord Mayor of London for an invitation. The proposition is favorably entertained, although an answer may not be immediately given.

Captain Pim is a typical Britisher, robust, square shouldered, of rubicund countenance, energetic in movement, steeped to the lips in Tory prejudices, but broad in his sympathies, and boldly blurting out truths that most men are too willing to conceal. His noble plea for the rights of common sailors has made him deservedly popular.

His scientific tastes are mainly in the line of geography, and he gave a highly interesting paper on Nicaragua, besides discussing Hilgard's paper on "The Depths of the Sea" and other papers. A sufficient number of our British visitors are burly and ruddy, to keep up the national reputation of beef-eating Englishmen; while many of them are so much like ourselves that they would only be distinguished by the purple badge in addition to the red worn by members of the American Association. No discrimination is made in the published list, and for the most part titles are omitted, which is much better than the British way of printing the whole formidable array.

The entire number of persons in attendance at the Philadelphia meeting must have exceeded 2,000, of whom about 500 were new members, and in many cases members availed themselves of the privilege of bringing along their wives and children. It cannot be questioned that the effect is salutary of bringing together so large a multitude of scientific people from this and other lands. They get acquainted with each other's views, and interchange ideas on a vast variety of subjects. The benefits thus derived are not only attainable in the lecture hall and the section to which the individual may be attached, but in the vestibules, conversation rooms, on the streets, at the hotels, and especially at the public receptions and during excursions, these men and women, whose minds are trained to think and stored with facts, have the opportunity to learn from each other.

General sessions were held each morning in the Academy of Music, where lectures were also given in the evening. The offices were in the Horticultural Hall near by. Sections met in rooms provided for them in these and other buildings. The Union League, University Club, Century Club, Philadelphia Library, Academy of Natural Sciences, Zoological Garden, International Electrical Exposition, and various other local resorts were open to members, and the temptation was perhaps yielded to in the case of some to see the sights rather than stick to business.

According to custom, Saturday was given up to excursions—a plan that has many advantages, especially as the entire meeting lasts over a week, and an interval of rest is necessary. An excursion party went to Cape May, another to Atlantic City, and a third to Long Branch, where they were addressed by Gen. Grant. But the most instructive as well as enjoyable trip was that taken in company with the mining engineers to the great anthracite coal fields. About 500 participated in this excursion, which was a compliment tendered by the Philadelphia and Reading R. R. There were twelve cars in the train, and 16 hours given to the trip. There were forty "aids" along, for the express purpose of imparting information. The route was by way of Pottstown, Reading, Mount Carbon, to the top of Broad Mountain.

Thence the cars were let down Mahanoy Plane, which is in places on an incline of 20 feet to the 100. The plan was to visit the Indian Ridge Colliery, for doing which elaborate preparations had been made. It was a holiday for the miners, and hundreds of them were gathered in line, and seemed to find great satisfaction and amusement in observing the procession of "sciencers," as it marched from the cars to the mouth of the pit. Special cages had been made in which, in parties of nine, the visitors were lowered to the bottom, a distance of 310 feet. The passageway was lighted by large lamps, and guides were also furnished, who led the way through the corridors and finally into a chamber about 50 feet wide, 200 ft. long, and 30 ft. high, which was lighted by electricity.

The seam of coal is 50 ft. thick. The richness of the deposit was a surprise to many of the foreign tourists, who said they had never seen such a magnificent coal field.

After inspecting the charts and maps in the engineer's office, and the breakers and other machinery, and filling their pockets with specimens, the excursion party were taken over the mining fields of the Lehigh Valley R. R., and ascended, in gondola cars, to the top of Summit Hill. Thence they went down by the Switchback to Mauch Chunk, and proceeded to Philadelphia. Of course there was much discussion going on all the while as to the peculiarities of the geology characterizing the region, the best methods of mining, and the utilization of the huge black heaps of waste that rose like mountains on every side. On the origin of the anthracite there were different theories, but the common opinion seemed to be that it was due to a chemical process, aided by heat and pressure during a period of plication, resulting in the driving off of volatile matter in the form of gas, leaving the hardened residuum with which we are familiar.

We must not forget to mention Mr. Muybridge's entertaining experiments in instantaneous photography of animals in motion, which members of the Association were invited to witness at the Zoological Garden. The botanists also had a charming excursion to the Old Bertram House and the Botanical Garden at Kingsessing. An excursion to Luray Cave, the Natural Bridge, and other points of interest was also arranged for at the close of the meeting.

In our next issue we intend to give some account of the papers read and work done by the sections.

The next meeting will be held at Bar Harbor, near Mount Desert, Maine; or in case that should not be found practicable, it will be at Ann Arbor, Michigan.

MAGNETIZATION OF POCKET WATCHES AT THE ELECTRICAL EXHIBITION.

In the earlier dynamos, considerable free magnetism existed in the vicinity of the polar extremities of the field magnets, showing a waste of energy due mainly to inefficient armatures. A fine watch brought into the vicinity of one of these machines was certain to become magnetized more or less; in many instances, valuable watches have been utterly ruined in this way. The evil became so great that several of our electric inventors undertook to devise apparatus for demagnetizing watches. One of the earliest of these machines was illustrated in our journal some four or five years since. It was the invention of the well-known electrician Mr. Hiram S. Maxim.

The magnetized watch was placed in a holder which revolved in every possible direction in horizontal and vertical planes before the face of a powerful electro magnet. At the same time, it was gradually withdrawn from the electro magnet until it was finally practically removed from its influence. However strong the magnetism of the watch when placed in the machine, when taken out of it no trace of magnetism could be found, and the watch, although it refused to go when placed in the machine, would generally be found running as usual when removed from it.

Another method devised about the same time, for accomplishing the same result, consisted in placing the watch to be demagnetized in a large helix supplied with a rapidly alternating current of electricity, the current being very strong at first and then gradually diminished to nothing. This process was found to very effectually demagnetize a watch. In the more recent and more perfect dynamo-electric machines the magnetism is more completely confined within the machine itself, so that the watch, unless brought into very close proximity to the machine, would not be liable to become magnetized to a degree to injure its operation. But should the wearer of a very fine watch be so unfortunate as to injure it in this way, he may readily demagnetize it himself by means of the process last described.

Some of our prominent watchmakers, in view of the liability of watches to become injured from this cause, have devised watches which are incapable of being magnetized to an injurious degree, and may therefore be used with impunity by electricians and others who are necessarily brought into close proximity with powerful dynamo-electric machines.

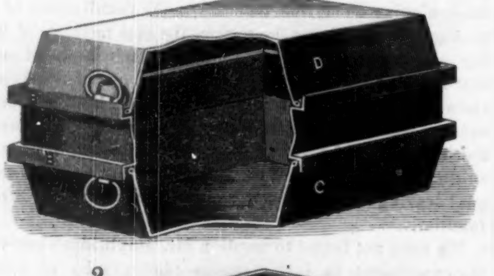
What we have said on this subject has been evoked by a correspondent who intends visiting the Philadelphia Exhibition. As there is no end of electric clocks and systems of electric time transmission in the exhibition, there will be no difficulty in ascertaining the exact time anywhere, and we advise our correspondent, if he has a valuable time piece which might be affected by magnetism, to leave it in the hotel safe while he visits the exhibition, if he desires to be absolutely certain that his watch will not be injured.

M. POINCAIRE (*Comptes Rendus*) contends that the attraction of the moon modifies the intensity of gravitation. Hence at the equator the clock is retarded by half a second yearly by the combined attraction of the sun and moon, and advanced a second at the poles.

A DOUBLE BAKING PAN.

Mrs. Annie T. Laube, of Huron, Dakota Territory, has obtained a patent for an improved double baking pan, an illustration of which is herewith given. The invention contemplates the use of two ordinary pans, united by a rim or frame placed between them, the rim having angular flanges on the top and bottom edges, to receive the edges of the pans, the bottom pan standing right side up and the upper pan being inverted. Fig. 1 shows the double pan arranged, with a part broken out to show the interior, C, the bottom, and D, the top pan, being united by the rim or frame, A, and held securely by the flanges, B, the rim with its flanges being also separately shown in Fig. 2. This simple arrangement provides a ready means for making an oven within an oven, as it were, so that anything being baked can be completely inclosed, or the top protected from too great heat.

1.



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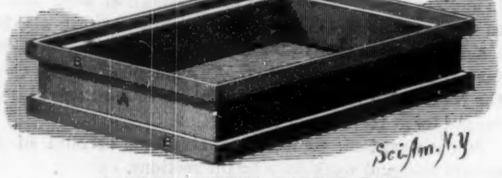
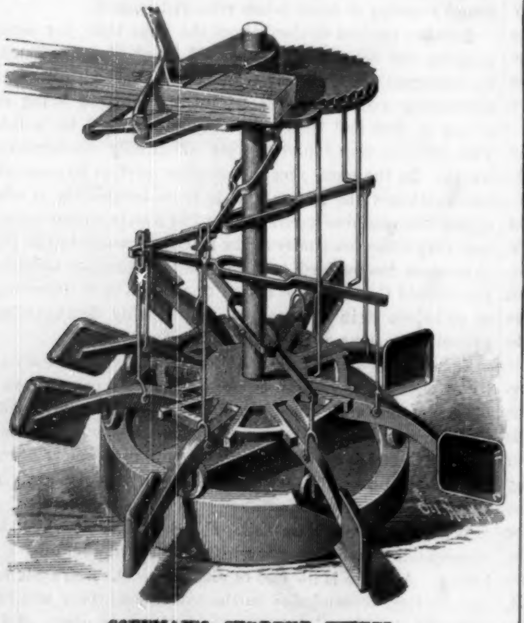


LAUBE'S DOUBLE BAKING PAN.

CURRENT WHEEL.

A vertical shaft journaled in the supporting frame carries a wheel, the hub of which has radial slots, in which are pivoted the arms carrying the buckets. The outer ends of the arms are inclined downward, and are supported, by means of rollers, on a circular track having that portion which is next to the current of water set lower than the remaining portion. To the vertical shaft are pivoted at different elevations a series of levers, each of which has its ends connected to two oppositely arranged arms. The ends of the levers are joined to the bucket arms by rods; these connections are so constructed that certain ends of the levers may be raised for elevating the arms to which they are joined to a position in which the buckets will be out of the water when it is desired to stop the machine. For elevating the ends of the levers a disk is loosely mounted on the upper end of the shaft, and is provided with pendent hooks of lengths corresponding to the elevations of the ends of the levers with which they engage to support the arms over the water. The arms are raised by the elevated portion of the track, so that if the disk is moved by hand until the hooks are over that portion, and is then held by the brake, the movement of the wheel will carry the arms into engagement with the hooks. The hooks will thus support the arms above the depressed portion of the track with the buckets out of water. When it is desired to start the wheel again, the disk is turned backward sufficiently to allow the arms to drop off the hooks into the water. The brake consists of two curved levers pivoted to the frame in such a manner that they partly embrace the periphery of the disk. The two levers are connected by a toggle lever, to the center joint of which is still another lever that is fulcrumed on the frame. To the toggle lever is pivoted a pawl which operates the disk, that is formed with ratchet teeth. When the lever is moved toward the disk, the brakes are moved out of contact with the disk, which is made to revolve backward by the pawl engaging against one of the teeth. The disk is connected with the shaft by a spring catch, and is thereby adapted to revolve with the wheel.



COFFMAN'S CURRENT WHEEL.

This invention has been patented by Mr. W. M. Coffman, of Roanoke, Va.

New Process of Reproducing Maps and Plans.

At a meeting of the Societe d'Encouragement held last month, Mr. Davanne gave a description of a new process called *Photo-calk*, which is employed at the department of public works for reproducing such parts of a map or plan as may be needed for the study of some new project.

Such reproductions have hitherto usually been made by tracings taken from the original. The new process consists in taking a photograph of the original, and then destroying such details as are not wanted.

After a negative has been taken, a positive print is made upon salted, non-albumenized paper. This print is not toned in the gold bath, but, after a simple fixing by hyposulphite, is dried. It is upon this exact reproduction of the original that the draughtsman makes the modifications that are required of him, and retraces all the details that are necessary for an understanding of the new project.

1. *When but a single copy is required.*—The draughtsman employs India ink for tracing upon the photograph all the details that are requisite. But the photograph, whether it be enlarged or reduced, gives a host of other details that are often useless, and this is especially the case with maps. So it is necessary to cause them to disappear. To effect this it is only necessary to immerse the sheet in a bath that will destroy the photograph. Various chloridizing solutions will do this; for example:

Bichloride of copper	15 grammes.
Water	100 "

This will cause the photographic images to disappear very quickly. After this, the sheet is washed and treated with hyposulphite of soda in order to dissolve the chloride of silver formed (without which the image would reappear when exposed to the light). After this the sheet is again washed. The result of this operation is that there is nothing left upon the paper but the lines that have been drawn by hand.

A solution of cyanide of potassium, in the proportion of 3 parts to 100 of water, will bleach the photograph very quickly, and the effect is almost instantaneous, if there be used a five per cent solution of this salt slightly colored with iodine. As the excess of cyanide dissolves the salts of silver formed, it is not necessary to do any fixing, but only to wash the sheet. This solution, when diluted with its own volume of water, still gives good results.

2. *When a number of copies are to be made.*—In this case the draughtsman's work must be transferred to stone or zinc. In order to make this transfer, the paper must contain a special sizing which photographic paper does not possess. The sheet is therefore prepared as follows: It is in the first place given a coat composed of starch or arrowroot, to which is added ¼ of mucilage of gum arabic and ⅛ of sugar. After drying it, a hot 10 per cent solution of gelatine is spread over the prepared side. After this has dried, the paper is calendered.

If the subject requires an impression in several colors, a single photographic positive will suffice. After this has served to transfer the first color, it remains intact with the exception of the sizing, which must again be applied. Then a drawing is made and the part necessary for the second color is transferred, and so on to the end of the series. It will be seen that there is thus obtained an exact register, the same sheet and the same image serving to make each of the plates in colors.—*Revue Industrielle.*

TRACE HOLDER AND DETACHER.

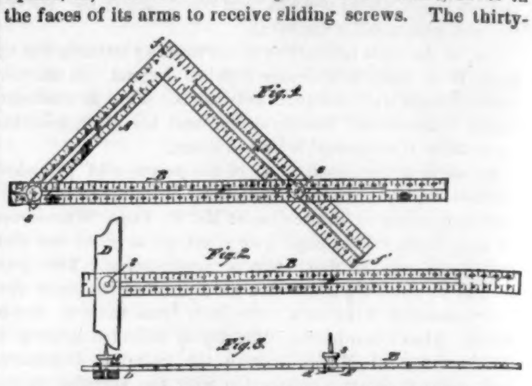
The two shanks, A, are fastened to and project beyond each end of the singletree. A clamp plate, formed with slotted ears and recessed slightly at the middle, swings on a cross pin passed through the ends of the shanks. A segmentally curved plate, K, the curved surface of which faces the clamp plate, is provided with two arms in which the squared head of a screw is loosely held—the head being adapted to swing on a pin, J, passed through the two shanks. The screw passes through a hole in the end of the fork, and enters a smooth socket on the inner end of the plate, K. Between the socket and the cross piece of the fork is screwed the ribbed nut, L. To one of the arms of the plate is fastened a cord that passes around each side of the dashboard from each end of the single tree. A cam lever, N, is pivoted on the pin, D, between the slotted ears of the clamp plate.

By turning the nut, L, the plate, K, can be adjusted a greater or less distance from the clamp plate, according to the thickness of the trace. When the cam lever, N, is turned down, it forces the clamp plate more firmly against plate, K. By swinging the plate, K, back the trace, O, can be placed between the clamp plate and plate, K, when the latter is swung in the inverse direction, thereby clamping the trace firmly between the plates. As the strain on the trace increases, the pressure with which it is clamped also increases. If the horses are to be detached while the vehicle is in motion—for instance, in case they run away—the plates, K, are swung back by pulling on the cord.

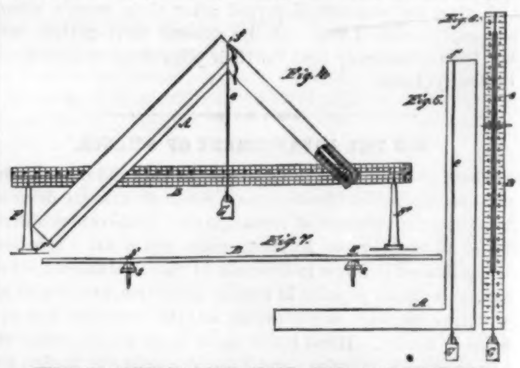
Further particulars regarding this invention may be obtained from the patentees, Messrs. Standing & Swaine, corner Natural Bridge Road and Grand Avenue, St. Louis, Mo.

COMBINATION TOOL FOR CARPENTERS.

Combinations of the adjustable and interchangeable parts of this tool will produce a combined square and bevel, and, among other uses, will give the angles and lengths of all kinds of braces, may be used as a rule, and may be rapidly and easily adjusted from one tool to another. The steel square, A, is formed with longitudinal dovetail grooves in the faces of its arms to receive sliding screws. The thirty-six inch rule, B, has a longitudinal slot through its face for the sliding screws to work in; this slot extends to within two inches of one end and within five inches of the other end. One side of the rule is divided into inches and twelfths, and the other side has lumber measurements indicating twelve, fourteen, sixteen, and eighteen feet, or other lengths.



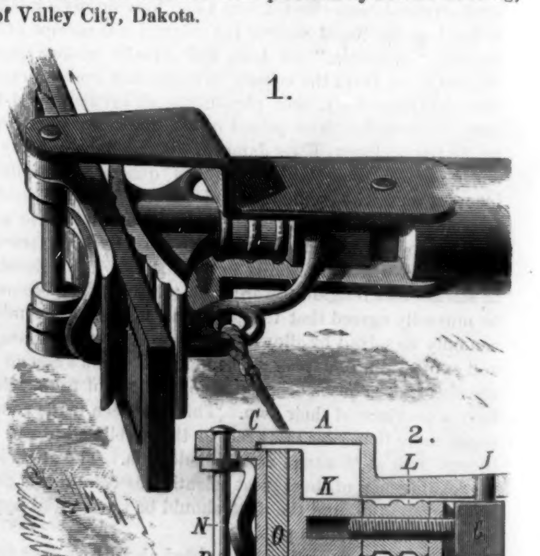
KING'S COMBINATION TOOL FOR CARPENTERS.



KING'S COMBINATION TOOL FOR CARPENTERS.

The sliding screws are so constructed as to form scribers. A T square may be formed by sliding the head piece, D, on one end of the rule; the square may also be used as a gauge by fitting the rule with the grooved sliding metal block, E. When the square and rule are combined, as shown in Fig. 1, the tool may be used for giving the angle and length of different kinds of rafters and braces. The rule can be readily taken off and put on, and when once set will be held firmly by the set screws. When the tool is to be used for leveling, as in Fig. 4, the supports, F, which screw into the rule or pass around it, may or may not be used. The method of using the tool as a level is clearly shown in the drawing; when used as a plumb the string is placed in the slit, *f*, as in Fig. 5. The yard rule may also be used as a plumb by attaching the string as shown in Fig. 6. Fig. 7 shows the tool arranged to be used as a beam compass.

This useful device has been patented by Mr. P. O. King, of Valley City, Dakota.



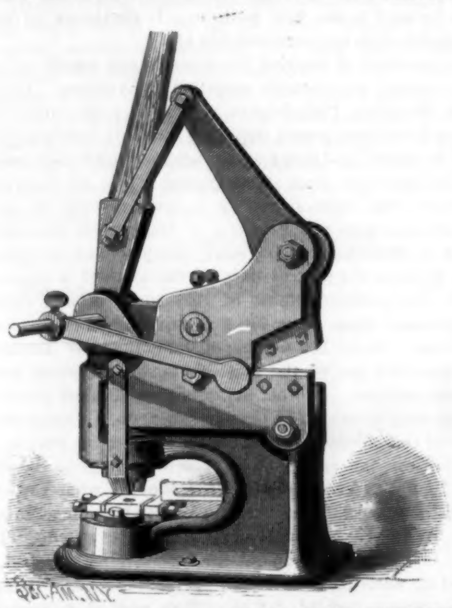
STANDING & SWAINE'S TRACE HOLDER AND DETACHER.

Production of Coal for 1883.

	Tons.
Great Britain	154,184,300
United States	76,184,000
Germany	46,698,000
France	19,900,000
Belgium	16,906,000
Austro-Hungary	14,936,000
Russia	8,000,000
India and Japan	2,600,000
Australia	2,170,000
Canada	1,416,000

IMPROVED MECHANICAL MOVEMENT.

The engraving represents a novel arrangement of compound levers for operating combined shearing and punching or other similar devices, recently patented by Mr. Peter Broadbrooks, of Batavia, N. Y. On the strong vertical extension plate of the base is pivoted, near the end, a frame consisting of two plates; the working lever is pivoted at the opposite side and at about twice the height of the frame pivot. The two frame plates are placed on opposite sides of the upper edge of the vertical plate, above which is a lever formed of a wide plate, and pivoted to the frame plates about in the center of the machine; the



BROADBROOKS' IMPROVED MECHANICAL MOVEMENT.

other end of the plate lever is joined to the forward cam lever by a pair of links, by means of which the plate lever is raised by the cam lever. These links also control a friction roller fitted between the top of the plate lever and the cam lever. The plate lever has a slot in the end that is mounted on the fulcrum pivot, in which the end of the hand lever fits like a rule joint, to mount both levers on one pivot. The hand lever is connected to the free end of the cam lever by strap links, as plainly shown, in order to obtain a powerful effect on the plate lever, which, besides being forced down by the cam lever, is also depressed by the weight of the frame, which becomes a working arm for operating the sliding stock for the punch. The plate lever has a shear cutter attached to its end under the cam lever, and one of the frame plates is also provided with a cutter.

To make a simple and efficient round bar cutter there is inserted, in a hole through one of the frame plates, a cutter, and in a corresponding hole in the plate lever is placed a second cutter; these are arranged at such a distance above the central pivot as to permit them to pass each other by the movement of the lever. These cutters are made in the form of tubular dies, and are fitted in round holes in which they can be readily turned to shift the cutting points of the edges, thus enabling the dies to be used much longer without grinding than if they cut only at one place. A gauge bar mounted on an extension of the pivot bolt may be set for the lengths to be cut off the rod. The construction of the punch is so clearly shown in the engraving as to need no detailed description.

M. C. BARTHELEMY (*Comptes Rendus*), having placed a number of hyacinths in glasses in a circle around the pipe of a stove, found that the roots took an almost horizontal direction toward the pipe, as a common center of attraction.

Fireproofing Process for Fabrics.

This process, due to Prof. Winckelmann, of Munich, consists in impregnating the materials with the following solution:

Protochloride of manganese	33 per cent.
Phosphoric acid	20 "
Boric acid or borax	10 "
Chloride of magnesium	12 "
Chloride of ammonium or sulphate of magnesia	25 "

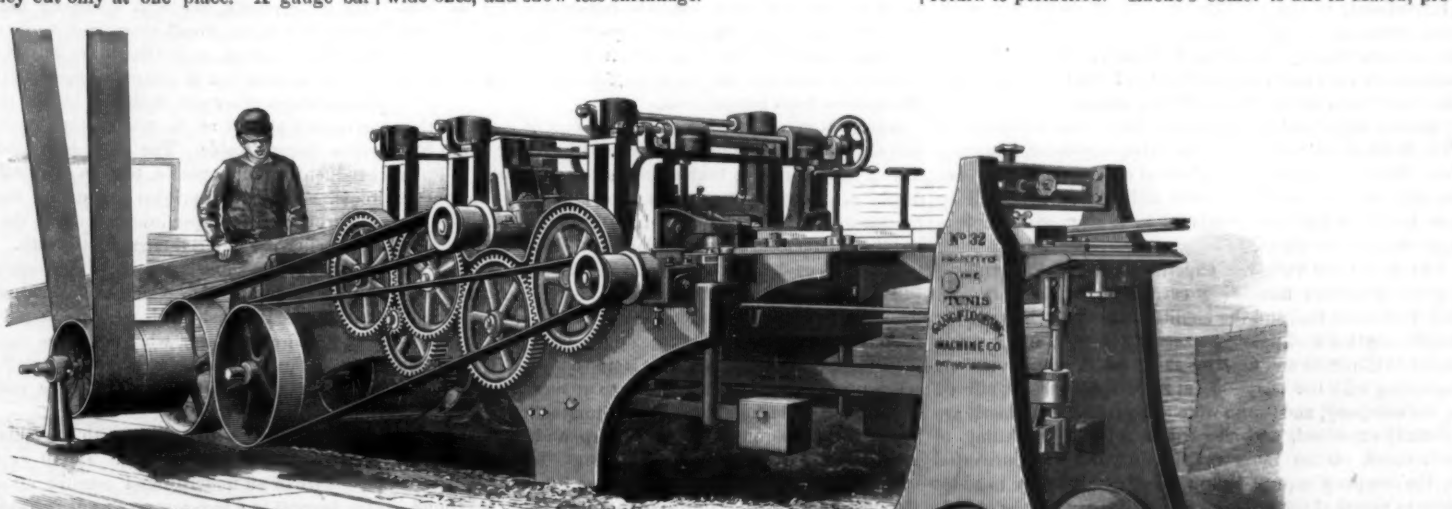
The materials are immersed for six or eight hours in this solution at the temperature of ebullition. They quickly become impregnated with double salts, insoluble in water, and the incrustations that are formed effectually protect the materials treated against fire. When exposed to a quick fire, they carbonize, but produce no flame.—*Chronique Industrielle.*

IMPROVED MACHINE FOR TONGUING AND GROOVING BOARDS.

The accompanying engraving of the Tunis gang flooring machine illustrates a patented improvement for planing mills, when applied to the manufacture of flooring, ceiling, wainscoting, weather boarding, and other lumber to be tongued and grooved, when it is desired to work more than one piece at a single operation. The improvement consists of an attachment suitable for any four-sided planer, and may be readily distinguished in the illustration, at the right of and working with the planer. The board is fed in to the left, and after passing through the planer is separated into two, three, or more pieces of tongued and grooved flooring or ceiling, all at one operation, and without the use of a rip saw, which can be removed entirely from the mills. As will be seen, this improvement greatly increases the capacity of planing mills for all such work, but of greater consequence than this is the saving in lumber effected, for all the middle saw kerfs are saved, leaving but the outer edges to plane, and in separating the board there is no waste.

The machine will also, with equal facility, dress each strip into a different product, the lumber being made without feather edges, but with a beveled edge tongue that is more easily inserted, and is said to give great satisfaction to carpenters, who say the boards come up so well together as to make a floor thus laid look almost like one board. The saving is represented as follows: Taking a rough board 16 feet long and 12 inches wide, and by this machine three pieces of flooring can be cut therefrom, respectively 3½, 3½, and 4 inches wide on the face, which, rated according to certain trade rules, would measure 17 feet of dressed flooring, as against only about 15½ feet to be obtained by the old process. As the mill is capable of making 30,000 feet of lumber daily, it will be seen that a saving of 1½ feet on every 16 feet makes a large gain. A Baltimore lumber inspector testifies recently to having counted the working by the machine of 27,980 feet 4·4 yellow pine boards, in widths of 9½ to 10½ inches, standing by as it came through three pieces at a time, of 2 to 3½ inch face, and making a net result of 30,181 feet, each piece being marked correctly in accordance with the general usage for marking.

Builders and owners of houses will do well to notice that users of this machine can furnish narrow strips for flooring cheaper than the wide ones, which contractors generally prefer, can be afforded under the old process. The narrow strips are not only handsomer, but of greater durability than wide ones, and show less shrinkage.



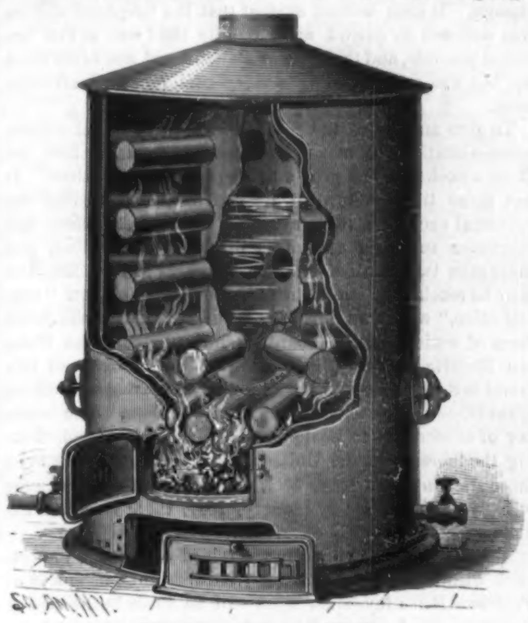
TUNIS' IMPROVED MACHINE FOR TONGUING AND GROOVING BOARDS.

The company do not sell the machine, but collect pay therefor by royalty. They agree to put the attachment on a planing mill free of cost, and after it is run for a week will remove it if not satisfactory. If it is satisfactory, the charges thereafter to be 25 cents per 1,000 feet of lumber worked.

This invention was patented by Mr. H. C. Tunis, but the corporation of the Tunis Gang Flooring Machine Co., of No. 6 South Street, Baltimore, has purchased the rights for the United States and Canada.

STEAM BOILER.

The illustration represents a boiler recently patented by Mr. S. P. Hedges of Greenport, N. Y., which may be used for house warming, agricultural purposes, pumping, etc., and which is safe and economical. An upright cylinder is provided with a number of projecting pipes, the outer ends of which are closed. The lower end of this cylinder is connected to a horizontal pipe, the ends of which extend out through the furnace wall. From the lower side of the end parts of this pipe extend tubes down at the opposite sides of the fire box, and provided with valve couplings



HEDGES STEAM BOILER.

with one of which the feed pipe is connected, while the other serves as a blow off for the removal of sediment. The casing can be made of two iron shells placed a little distance apart as shown in the engraving, or of brickwork, as may be most convenient.

Within the pipes projecting from the cylinder are placed smaller pipes of such a length as to project beyond the inner ends of the pipes in which they rest. These pipes are centered, and supported by pins projecting from their opposite sides and resting against the inner surfaces of the large pipes. The upper parts of the inner ends are cut away to form cups or spouts to receive the descending water through the middle part of the cylinder, and cause it to flow through the pipes to the inner ends of, and out through, the large pipes. The opposite sides of the horizontal pipe are furnished with projecting pipes having interior circulation pipes. Manholes are formed at the ends of the cylinders to give access to the interior for convenience in cleaning. The steam pipe is connected with the upper part of the vertical cylinder. With this construction the entire outer surface of the cylinders and pipes is exposed to the fire, and a thorough and continuous circulation of the water is established.

DURING the next year three comets of short period will return to perihelion. Encke's comet is due in March, probably in the first or second week, according to the elements of 1881. The next is Tempel's comet, 1867 II., in the case of which it is not possible to assign the time of perihelion passage without the calculation of the perturbations due to the attraction of Jupiter, near which planet the comet was situated during the last half of the year 1881; the least distance of the two bodies having been about 0·57 in October. The third comet referred to is Tuttle's, last observed in 1871, the perihelion passage probably in September or October.

THE TELEPHONE.

One of the most striking characteristics of the present age is the marvelous rapidity with which useful inventions are introduced. The telephone is a striking example of this. The first public exhibition of the telephone was in the year 1876, at the Centennial Exhibition in Philadelphia. In the following year the first telephone exchange was established in Boston with five subscribers. With extraordinary forethought, the primitive switchboard illustrated in our cut was made long enough to contain switches for five subscribers in addition to those who originally joined the exchange. It soon became evident that the telephone system was destined to extend more rapidly than was at first believed possible, and the original switchboard was never filled up, but was supplanted by a more comprehensive arrangement.

To give an idea of the rapid development of telephonic communication, it may be interesting to show how the Boston exchange has grown to its present proportions. It has many times outgrown its quarters, and besides the principal exchange, there are now two branch offices and seventeen suburban exchanges in direct connection, and more than two hundred cities and villages in New England may be reached by telephone from Boston. The new "central office," which we illustrate, is furnished with the latest form of multiple switchboard, manufactured by the Western Electric Company, in Chicago. The capacity of this board is 3,500 lines, and together with the two branch offices gives Boston a capacity for nearly 6,000 lines. The number of subscribers in Boston, April 1, 1884, was 2,386. Taking the increase in the United States, the figures are even more startling. In May, 1877, there was but one exchange with five subscribers; in January, 1884, there were 906 exchanges, with 123,625 subscribers.

Although the telephone has attained its present importance within the last decade, and the first announcement of Professor Bell's invention must still be fresh in the memories of most of our readers, yet a concise history of this wonderful invention will not be out of place.

The credit of first conceiving the possibility of transmitting articulate sounds by electricity is due to Prof. A. Graham Bell. His familiarity with the applied sciences, particularly acoustics, dates from early youth. He was instructed by his father, who was engaged in the difficult task of teaching the deaf to articulate, in the physiology of the human throat and ear. Even when quite a boy, young Bell had ingenuity enough to construct a talking machine which would utter one or two simple words. About ten years ago Prof. Bell was engaged in increasing the efficiency of the electric telegraph by employing the vibrations of reeds of different pitch in connection with the usual telegraphic apparatus. While engaged in perfecting his system of harmonic telegraphy, he conceived a method of making a complicated receiver, consisting principally of a set of reeds of different pitch, giving forth tones corresponding to those entering a similar transmitter connected by an electric current with the receiver; much as the strings of a piano will respond to the human voice. Coupled with the then recent discovery of Helmholtz, that the vowels and other vocal sounds were simply the combination of several elementary notes, Prof. Bell at once perceived the possibility of transmitting speech.

It only remained to try the experiment, and to improve and simplify the apparatus, in order to make his invention practically useful in every day life.

Immediately on the publication of Prof. Bell's success in transmitting speech by electricity, the whole scientific world turned with interest to the new wonder. Many improvements were soon made in the details of the telephone; and other inventors, as Edison and Blake, produced transmitters of greater power and better suited for actual service than Prof. Bell's instrument. As a receiving telephone, however, Prof. Bell's invention is in universal use in almost the exact original form, and it seems unlikely that it will be superseded by any other receiver, so perfect and simple is it at the present time.

The extent and variety of experimental work for improving the telephone now being carried on by the American Bell Telephone Co., and the facilities which they possess for continuing this work, are not generally known, and it is our object to illustrate and describe these facilities. Inventions connected with the telephone are continually being offered to the company, and those which appear to have merit are carefully examined, and adopted or rejected according to their value. Often those inventions which are purchased by the company require more or less modification to adapt them to practical use. To successfully carry out the objects indicated above, the company employs a corps of expert mechanics and others skilled in the principles and practice of electricity and its allied sciences, and has provided an experimental shop, a chemical laboratory, and an electrical testing-room, fully equipped with the necessary machinery and apparatus. The experimental shop, well shown in the illustration, is remarkably well supplied with such tools as are required for producing and altering electrical apparatus. It has a full complement of iron and brass working machine tools, carpenters' and mechanics' benches, forges, and other mechanical appliances. Power is supplied by a gas engine.

In addition to this purely experimental work, the department is continually making tests of samples of wires, of insulating material, and of supplies of various kinds, both as a basis of purchase and to maintain the required standard of quality. For these purposes special apparatus is provided where it is required; as, for example, tensile and torsional wire-testing machines. Perhaps the most important tests made are those upon the telephones and transmitters manufactured for the company by the Western Electric Co., of New York, Chicago, and Boston. As this company is licensed to manufacture electrical apparatus and supplies under all the patents owned and controlled by the American Bell Telephone Co., and actually produces upward of 50,000 new telephones yearly, the magnitude of the work of testing is very great. Large numbers of telephones are sent abroad, as nearly all the telephonic apparatus used in Belgium, Holland, Norway, Sweden, Russia, and Italy is made in this country.

Very interesting and expensive experiments are often undertaken by the company. Among these may be mentioned experiments in long-distance telephoning. A very heavy copper metallic-circuit line, nearly 300 miles long, has been erected between New York and Boston, and conversation is carried on between those cities with perfect ease, much more satisfactorily, in truth, than over most of the local city circuits. Plans are now being perfected for overcoming certain difficulties in connecting local subscribers to this trunk line, in order to insure satisfactory service and secure commercial success. This line will undoubtedly be soon in the hands of the local company, and open for public use. The results thus far attained point to a speedy solution of the long-line problem; and in a few months the wonder will be why long-distance telephoning was not sooner introduced.

In order to meet as far as possible the public demand for underground wires, the company has been and is now making extended experiments upon various makes of subterranean cables, with as yet only partial success. To give an idea of the vast sums of money the company is expending in this experimental work, it is only necessary to state as a single example that one of these cable experiments cost $30,000, and that this is by no means the maximum outlay for a single experiment.

Of the future possibilities of the telephone little can with safety be said. Recently an invention has been brought out for making the telephone an accurate timekeeper. By means of a simple apparatus, including an accurate clock stationed at the central office, a signal is given once a minute indicating the precise time, somewhat after the manner of a repeater watch. This system is now on trial at Lowell, Mass., and seems likely to be generally introduced.

The Bell telephone exhibit at the Electrical Exhibition now in progress at Philadelphia is well worth the careful attention of visitors. It forms one of the most prominent features of the exhibition. The whole history of the telephone from its first conception to the present complex system is well illustrated by models, some of the original apparatus being on exhibition. Many forms of apparatus now discarded from use are shown; and all the latest improvements, including the most recent style of multiple switchboard, may be seen.

The International Electrical Exposition.

(SECOND PAPER.)

The exhibitors, at first somewhat dilatory, have now for the most part got their apparatus in working order; a score of fly-wheels spin and impart their regular movement to innumerable and curiously contrived apparatus throughout the well ordered corridors. A careful examination of the collection shows that the boast of the managers that they would have the finest workmanship known in the electrical field was not vain, and sustains the assertion made in these columns that the collection was to be commended for its completeness rather than for the novelty of its exhibits. In reality, the exposition now being held in Philadelphia is international in little else but the name, for only a tithe of the exhibits come from beyond seas.

Indeed, it may be said, without the fear of contradiction, that of the 2,000 exhibits, fully four-fifths come from New York. But the spirit that animates this enterprise is Philadelphian, and the ability shown in organizing the various departments, by the committee of the Franklin Institute having the conduct of the exposition, and the good judgment and fairness evidenced by its decisions, do much to prove that the handiwork of American electricians could not have been intrusted to better hands nor shown under more favorable conditions.

In the arc light section a new lamp has appeared which, when properly displayed, is likely to attract no little attention among those engaged in street illumination. It is called the Edgerton thorough feed arc lamp, and is designed to greatly reduce the cost of arc lighting. If the projectors of this lamp do not deceive themselves, it is, perhaps, among the possibilities of the future that a profit will be found in selling the arc-light approaching that in selling the plant.

The Edgerton arc-light consists of a framework of cast iron supporting the tube for feeding the carbon and the other operative parts of the lamp. The body or base of the lamp contains the electro-magnets for feeding the carbon and also supports a horse-shoe shaped frame for supporting the globe. The peculiarities of the lamp are: First: The substitution of an indestructible point of iridium set in a wrought iron rod properly protected from oxidation, for the negative carbon electrode of the lamp. This saves the use of one carbon. Second: It is thorough fed; for all the carbon of the positive electrode is consumed; the latter end of each carbon becoming attached to the carbon, which follows it in course so as to form practically a single stick. Third: It will turn and feed in any position in consequence of the carbon being carried forward by two grooved rollers under strong pressure. Fourth: Owing to the construction and operation of the feeding mechanism, it cannot close or extinguish the arc during the full flow of the current. The operation of the lamp may thus be stated: The carbon being placed in position, its forward end in contact with the iridium point, and the currents being switched into the main magnets immediately upon the arc to say one thirty-second of an inch, and the armature coming in contact with the poles of the magnet remain fixed in that position.

The small magnets in the shunt circuit then come into play, and, as soon as the arc has turned to one-sixteenth of an inch, or whatever length has been set for it, the armature is lifted, turning the rollers and carrying the carbon point forward to the first position. It continues to repeat this action until the current is cut off.

The question of burying the wires is one which, of late, has attracted considerable attention in America. In New York, Brooklyn, Philadelphia, and other large cities, ordinances have been passed requiring that all overhead wires shall be buried, and fixing a date beyond which their owners may not maintain them above ground. It is not surprising, therefore, that there should be a large display of underground apparatus and conduits at the present Exposition, nor is it remarkable that, since many reliable electricians have declared the plan to bury all the wires of a great city to be impracticable, most of these underground exhibits should bear upon their faces the unmistakable evidences of failure. In the last number of the SCIENTIFIC AMERICAN was described one of the most promising of these underground systems. Another and perhaps still more promising system may be said to be constructed upon a theory the reverse of that adopted by the underground cable people. In other words, the constructors of this underground system have sought to accomplish with a conduit what the cable people may be said, without injustice, to have thus far failed to do, or rather to demonstrate their ability to do. They claim that they can keep out all moisture and protect the boxed-up wires from surrounding mal-influences by means of the interjection of dry air. How well they have succeeded it is not the purpose of this article to decide. It will simply be sought to describe the apparatus which, since altogether novel, merits some little attention. The general appearance of the conduit is that of a deep trough, having rails for a miniature electric motor. There is an upright upon this motor, furnished with arms bearing hooks. When it is necessary to introduce a wire, the motor is started from the manhole at the intersection of the streets through which the conduit has been laid. At the opposite manhole—one block distant—a lineman receives the end of the wire from the motor, and shakes it off the hook into whatever apartment it is designed for. Connections to houses from the conduit may be made by an adjunct running under the sidewalk. The walls of the conduit are made of blocks composed of asphalt compounded by a new process, whereby it is said to be rendered impervious to moisture and to be given unusual strength. The metal uprights, brackets, and pockets are connected with the earth so as to ground induced electric currents. This construction is said to be much cheaper than iron, and not so apt to become electrically charged. When wires are laid parallel and currents of electricity passed over them, every make, break, or change in tension in the electrical current in one or more of the wires will produce induced currents in neighboring wires, the currents being inversely proportional to the distance of the wires apart. With telegraphy these induced currents are of little consequence, but with telephony the converse is the case, for with the small electromotive force required in the telephonic system, their effects are felt at once and necessitate the application of means to overcome these malign influences, which otherwise would so injure the transmission of articulate speech as to render the burying of telephonic wires impracticable. The sheet-iron pockets being good conductors and magnetic, tend to carry off the induced currents. The metal uprights supporting the curved pockets are grounded at proper intervals along the line to assist in conveying the induced currents to earth. A portion of an anti-induction cable is shown in the underground exhibit at the Exposition, which is said to be adapted to underground purposes. It consists of weaving together insulated telephonic wires, forming what might be called the "warp"; bare inclosing wires forming the "weft." The latter are grounded through the agency of the pockets and conduit auxiliary ground wires.

The difficulties of dealing with currents of high electromotive force are well known. Damp weather or even the moisture of an underground conduit allows the escape of the current to a lesser or greater degree, and thus reduces its tension. This has heretofore rendered the burying of such wires impracticable.

The projectors of this system claim that in their conduit the tension of the current is retained at its maximum; there being no dampness to affect the tension. Their conduit is incased in brick, and is so constructed, they say, that they can keep the air within under considerable pressure and perfectly dry. If there be an appreciable quantity of moisture in the atmosphere, an air pump is made to force the air in the conduit through a drier, which absorbs the moisture, and chemically dried air is made to pass into the conduit. When the pressure reaches a certain figure, the excess of air is excluded through relief valves. Currents of high tension tend to pass off the conductors, but this tendency decreases as the pressure of the surrounding medium (air) increases. This effect, it is said, is greatly increased by the thorough drying of the air in damp weather before passing into the conduit.

As the pressure is constant, there must be an efflux, and should there be a small leak the passage of air will be from inside outward; thus preventing the ingress of the interior atmosphere.

The silicious bronze wires in the manufacturing exhibits demand, by reason of the important part they are likely to play in the future, more than a passing notice. In this era of great enterprises, where economic processes are continually sought after, that which combines a maximum efficiency with a minimum of labor is looked upon as the most desirable. Now, recent experience has shown that silicious bronze wire is about twenty-five per cent. cheaper than iron wire, everything considered, besides having nearly double the conductibility. So far as tensile strength per square inch of section is concerned, iron wire has no advantage. Perhaps this might be better explained by saying that the far greater weight of the iron wire costs more to handle, requires more and stronger supports and insulators, nearly twice as many posts, and more than twice as many couplings than silicious bronze. The subjoined tables, compiled by an authority, give the electrical resistances and approximate weights per mile of silicious bronze.

TELEPHONE WIRES.

Diameter.	Section.	Resistance in ohms per mile.	Weight per mile.
Mm.	Sq. mm.		Lb.
1	0·7854	103	24·6
1·05	0·8655	93	27·1
1·10	0·9503	92	30·0
1·15	1·0383	77	32·5
1·20	1·1310	71	35·6
1·25	1·2252	64	38·5
1·30	1·3273	61	41·6
1·35	1·4294	56	44·8
1·40	1·5393	51	48·3

TELEGRAPH WIRES.

1·25	1·22	22·5	38·5
1·50	1·7671	15·6	55·6
2·00	3 1416	8·8	99·2
2·25	4·4741	6·2	141
2 50	4·9087	5·6	156
2·75	5·938	4·6	187
3·00	7 0685	3·9	223
3 50	9·6211	2·8	303
4 00	12·5664	2·4	396
4·50	15·9043	1·8	502
5·00	19·6349	1·4	620

Now let us compare this silicious bronze wire with iron, steel, and copper wires, taking one millimeter as the diameter in each case.

Description of wire.	Tensile strength per sq. in. in tons.	Resistance per mile in ohms.	Relative conductivity.
Pure copper..................	[illegible]	[illegible]	100
Silicious bronze telegraph. ..	28·57	34·5	96
Silicious telephone............	48·25	103	34
Phosphor-bronze telephone..	45·71	124	26
Swedish galvanized iron....	22·86	216	16
Galvanized Bessemer steel..	25·40	249	18

The galvanized wire of five millimeters diameter, now in general use, weighs about 540 pounds to the mile. It could be replaced by wires of silicious bronze, having a diameter of only two millimeters and weighing about a hundred pounds to the mile. Silicious bronze wire of 1·10 millimeters and weighing 29 pounds to the mile can readily be made to do the work of ordinary steel telephone wires of two millimeters diameter and weighing 87 pounds to the mile.

Among the exhibits of the Ordnance Department, or rather of its auxiliary, the Signal Service, is a field telegraph train by which telegraphic communication may be kept up between the several portions of an army or between scattered bodies of troops. This is an exceedingly important branch of the Ordnance Department in these days, and it must be said that those who designed the present system have acquitted themselves well. It is modeled after the French system, or rather it has many points in common with it, divested, be it said, of the elaborate and cumbersome details of the system employed in the French army, which, as was clearly demonstrated in the maneuvers of four *corps d'armee* last fall, can only be carried out under the most favorable conditions. The system exhibited by Captain Michaelis in the present Exposition has this to commend it, and may therefore be more than favorably contrasted with the French. It is designed for use as well under unfavorable conditions, viz., when time presses and in rough country, as when time is of no moment and a large body of trained men are at hand to carry out details. If it have a serious defect, it is that the line is too heavy for the service; the French linesman furnished with light silicious bronze wire being able to traverse a much longer distance, and the mass on the bobbins being very much less.

In measuring the velocity of projectiles, it is easily seen that our Ordnance Department is by no means behind the age; several new and interesting features having been recently introduced. A long tube has two delicate diaphragms within. These are electrically connected with a disk whereon the moment of their disturbance is recorded. As the projectile passes through, the two contacts are instantaneously signaled.

The instrument devised by Captain Le Boulenge of the Belgian artillery has given excellent results, one or two not important changes having recently been made by him. It can be used both as a micro-chronometer and as a velocimeter. Two electric circuits are established within a tube through which a projectile is fired.

When the first circuit is reached, it affects an electro-magnet having for armature a cylindrical rod acting as a chronometer, to which are attached two enveloping zinc tubes as recorders. When the second target in the tube is reached, it sends a current through an electro-magnet, the armature of which, shorter than the first described, is called the register. Then there is what is called an indenter; consisting of a circular knife fixed in a mainspring. This is readily primed by means of a catch on a lever. Now when the first circuit is reached the chronometer is made to fall, and upon the breaking of the second circuit the register also falls. This depresses the end of the lever, the mainspring is released, and the knife springs at the falling chronometer and leaves an indentation on the recorder. So simple is this instrument that only a short calculation is necessary in order to find the velocity of the projectile. The recorder is marked highest when the velocity is lowest. Of course it is necessary that the operator thoroughly understands the theory upon which the instrument is constructed, for certain allowances must, perforce, be made, for instance for the time required for the demagnetization of the chronometer and the register before the fall takes place. In advance of operations it is, of course, necessary to test the instrument; a disjunctor being used to examine both circuits.

The Schultz chronoscope, invented by Capt. Schultz of the French artillery, designed for measuring very short intervals of time, and the electro-ballistic pendulum, are also to be seen in the exhibit.

There is a very interesting exhibit in the theoretical department of the Exposition, on thermo-electricity. There are those who affirm that these machines will at some future day supplant the dynamo, as the dynamo has supplanted the galvanic battery. This thermo-electrical machine is made up of a system of plates composed of alloys of antimony and bismuth soldered together and properly joined in the usual way, the joints being heated by Bunsen burners.

A very interesting apparatus for safety from lightning is shown by a telephone company. It is designed to be placed outside of a building, and contains a lightning arrester and fusible wire, and a cut-out switch operated from the inside. By this the electric current can be wholly disconnected from the interior. The telephone subscriber upon leaving his office can entirely disconnect the instrument until his return, and old ladies who show a disposition to be timid as to lightning when thunder clouds prevail, may find in this a convenient means of arresting the lightning and their fears.

A curious feature of the Exposition is the important part taken therein by gas, in one form or another. It might fairly be claimed for the gas-motor that it is part of an electric-lighting plant. It would, however, be a refinement of sarcasm to set up such a claim for the gas lamp. But the gas lamp is there; not the little, flickering jet, confined, by reason of a clogged aperture, into one long, thin prong of flame, but represented in all the grandeur of a Siemens regenerative gas burner—intense and mellow. The admission of this lamp would seem to be but a simple act of justice, and as such does credit to the wisdom of those having the conduct of the Exposition, for, though it cannot from any point of view be classed under the head of electrical appliances or apparatus, it represents a system of lighting which the electric light is designed to supplant, and unbiased decision can only be reached by a comparison of the two systems side by side.

It must be said that the big gas lamp cuts a good figure, notwithstanding that the arc lamp—for, of course, there is no comparison between it and the small incandescent—is displayed under the most advantageous conditions. By this it is meant that the arc lamp, when standing alone, brilliantly illuminates certain portions of the space about it, and leaves other portions in deep shadow, while as it is displayed at the present Exposition the shadows are cut out by the glare of the adjacent lamps. It is only just to say this much; only simple justice to say that the arc lights are shown under favorable conditions, and that the big Siemens regenerative burners are shown under ordinary conditions; their light when isolated being evenly diffused, while the converse is the case with the arc light.

Subjoined is a table giving the consumption of gas per hour and the candle power of the gas burners at the Exposition:

Gas Consumption per hour.	Candle power.
100 cubic feet.	1.000 to 1.200
75 "	750 " 900
50 "	450 " 500
35 "	300 " 350
25 "	200 " 250
14 "	100 " 125
8 "	70 " 80

This, even if not an underestimate, shows that these lamps, with gas at $2.25 a thousand cubic feet, are fully as expensive as the arc lights, if the figures at which they are rented are reliable.

So far as the incandescent lights are concerned, they are holding their own, as it was known they would. On the hottest evenings they have neither vitiated the atmosphere nor sensibly heated it, whereas, were these hundreds of lights, now aglow, given off by gas, it is safe to say that the atmosphere of the great hall would be intolerable.

Correspondence.

Filtration of Oil.

To the Editor of the Scientific American:

One of your correspondents some time ago wished to know if there was any way to clean sperm oil so as to use it over again. I expected some one would give an answer, so I have waited to see what it would be; but seeing none, I take the liberty to state that I took a common wash boiler, had a faucet put in the bottom, and soldered on tin lugs about half way down inside, made a wooden frame that would go inside and rest on to the lugs. I tacked on to this frame for the bottom four thicknesses of coarse bagging; on to that I spread loose four thicknesses of cheese cloth, then sprinkled over the cloth coarse soft wood sawdust, then four thicknesses of cheese cloth, then sawdust again, for three successive times, with four thicknesses of cheese cloth on the top. I pour the oil into this frame within the boiler, and it will filter all the dirt out. It will become colored by constant use and filtering, but it will be free from dirt. I found by using this filter I have made ten gallons of sperm oil do the lubrication that would have taken thirty gallons. I think that is worth saving. Cheap filter, but it does the work.

GEO. BOXLEY.

Troy, N. Y., September, 1884.

Lifting of Persons by the Fingers.

To the Editor of the Scientific American:

Your answer to T. G. L. (No. 15), in the SCIENTIFIC AMERICAN of August 23, indicates that you have never tried the experiment referred to. I have in this manner:

Two persons stand on each side of a fifth, who is seated in a chair. The four raise their hands (which are clasped with the forefingers extended) as high as possible over their heads, at the same time inhaling deeply. They then simultaneously bow as low as possible (always facing the sitter), bending the body from the hips, and swinging the extended arms from the shoulder till the hands touch the knees, at the same time exhaling as strongly as possible, these motions being repeated three times together. As they rise from the last position for the third time, the extended forefingers are placed under the knees and arms of the sitter, and he is lifted high in air as light as a feather. In this way I have seen four young school girls, under sixteen years, lift a man of 180 pounds with no more apparent exertion than would be required to lift a three pound weight. To one who tries this experiment for the first time the result is very surprising.

"HAMLET."

Washington, D. C., Sept. 3, 1884.

The Liquefaction of Air.

M. Olzewski has contributed to the *Comptes Rendus* some of his further observations upon the temperature and critical pressure of air. He says he has obtained 6 cubic centimeters of air compressed into the liquid form. This air did not contain carbonic acid or aqueous vapor, and was allowed to evaporate in a vacuum, and also under atmospheric pressure. A very low temperature was thus produced, as low as —205° C., being observed when the evaporation took place *in vacuo*. It appeared, however, that the recorded temperature of the liquid air at the critical point was not so low as that of its constituents, oxygen and nitrogen, separately. Consequently, M. Olzewski was led to think that at the critical pressure the components separated; nitrogen evaporating in the larger proportion. Therefore, although air is a very convenient refrigerant, for various practical reasons M. Olzewski is disposed to prefer the use of nitrogen in his researches upon the liquefaction of hydrogen, as he thereby hopes to be able to command temperatures even lower than that given as the evaporation point of air in a vacuum.

Cost of Bread in Boston and New York.

Mr. Atkinson shows us that the farmer in Iowa receives $405 for the wheat to make 100 barrels of flour, and that the railroad then receives $117.50 for taking 450 bushels of wheat from Iowa to Chicago, and 100 barrels of flour from Chicago to Boston. Upon this the railways make about $35 profit. It costs $50 to mill the flour, $45 for barrels, $30 for the merchant's commission and the cartage in Boston, $410 for the labor of making 100 barrels of flour into bread, for fuel with which to bake it, yeast, salt, etc., costing only $1,057.50 from the farmer on to the baker's counter for 100 barrels of flour made into bread, 270 to 290 pounds per barrel, or about 3½ cents per pound, while the people of Boston pay $1,620, or about six cents per pound, against 3½ cents in New York.

Economy of Expense of Management in Life Insurance.

The current issue of the SCIENTIFIC AMERICAN SUPPLEMENT contains a very able article on this subject, written by Walter C. Wright, Actuary of the New England Mutual Life Insurance Company. The article will repay careful perusal, and the tabular statement which accompanies it will be found of much value to any one interested in life insurance, as it shows both the expense per $100 of claims paid and the net rate of interest earned. These figures are taken from the official reports of the various companies, and furnish conclusive proof as to which of the companies are the best and safest.

TRANSMITTING POWER FROM A CENTRAL STATION.

There has long been needed a system for the transmission of power from a central station to distant points which would be economical and reliable in operation and simple in construction, and which would overcome the obstacles attending the use of either steam, compressed air, water, or electricity. The advantages to be derived from such a system are too well known and appreciated to need discussion.

By using an endless wire rope, the entire power of the driving engine—less only the loss occasioned by the friction of the pulleys over which the rope travels—can be utilized. When the bearings of the pulleys are properly constructed, this loss is but trifling; and it is an important feature of this method that just as much power can be taken from the rope at one or two miles from the engine as can be taken from it directly at the station. The adoption of such a plan would result in the saving of the cost of engine and boiler and of the expense of their attendance, would permit the space occupied by such machinery to be utilized for other purposes, would abate the smoke nuisance arising from the many furnaces now clustered within a small area, and would enable those located along the line of the cable to obtain a power just sufficient for their work, whether it be the running of a single sewing machine or the driving of an entire factory.

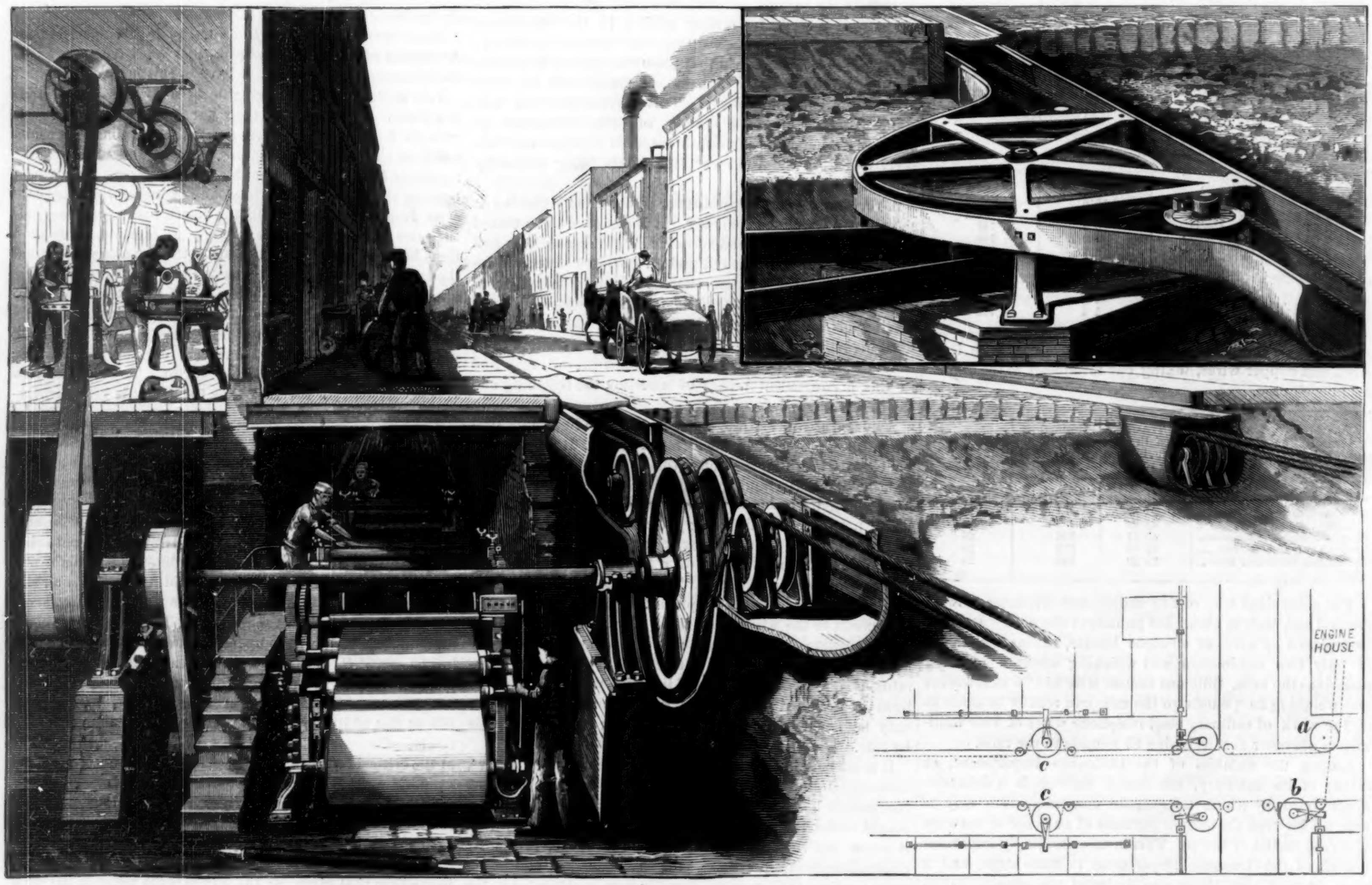
In order to take power from the cable and transfer it to stationary machinery, there is employed a grip pulley. At the point where the power is to be taken from the rope an opening is made in the tube, or a suitable chamber connected with the tube is constructed, so that the cable can be deflected and made to pass around one side of a grip pulley which is mounted on a shaft in the opening. Placed at each side of the opening are grooved pulleys of a suitable size, which are so mounted as to guide the rope to, and lead it away from, the grip pulley. This pulley can be placed either vertically or horizontally, as illustrated in the engraving. On the shaft is mounted a sliding clutch, on a feather, which can be moved against the side of the pulley, and either engage it by friction or by means of clutches. The speed can be easily regulated, as it is taken from the cable by means of differential pulleys, and the amount of power deflected at any point can be measured by a dynamometer. Any number of branch or supplemental endless cables can be located at various points and driven from the main cable. In order that no delay may be caused by the breaking of the cable, it is proposed to mount two ropes on two independent sets of pulleys in the same tube, thus keeping one rope always in reserve.

Among the many advantages which would accrue from the successful operation of this system in large cities are those having a direct bearing upon the safety and health of the community. In this city we have from five to six thousand boilers, which are just so many sources of danger to life and property, even when surrounded with every precaution and tended with the utmost care and skill. The permanent removal of these boilers would have a direct effect upon the atmosphere by relieving it of the noxious vapors arising from the combustion going on in their furnaces.

Another sanitary result would be obtained by doing away with the numerous steam engines, many of which exhaust into the sewers, the effect being to drive the hurtful gases up into the buildings.

The elevator shaft, with its accompanying engine, is now an essential part of almost every building erected in the business quarters of a city. By a system such as we have described these could be more cheaply built and operated than they can at present, and, by reason of an ample and constant power always at hand, their usefulness would be greatly increased.

The system has been examined and warmly commended by Silas Seymour, late State Engineer of this State; by Silas B. Dutcher, late Superintendent of Public Works of this State; by C. E. Candee, the inventor, and former superintendent of the Wabash Railroad, and others. Any further particulars which may be desired can be obtained by addressing M. H. Farley, Esq., the authorized agent of the inventor, at 165 Greenwich Street, New York city.



BOONE'S METHOD F TRANSMITTING POWER FROM A CENTRAL STATION.

The accompanying engravings represent a system recently patented by Mr. John L. Boone, of San Francisco, California, in which a wire rope is used to transmit power from a central station. The tube or tunnel in which the cable runs is laid below the surface of the ground, and is led in any required direction and its course changed as desired, but it finally leads back to the central station from whence it started. Inside of the tube, at proper distances apart—about twenty feet—are mounted vertical pulleys, except at the angles where the direction of the tube changes, when horizontal pulleys are substituted. A wire rope is then laid in the tube, so that it will be supported upon the vertical and passed around the horizontal pulleys, and its two ends united, making it endless. In the engine house or at some other suitable point on the line is constructed a take-up for the slack of the rope, which is thereby kept taut. The cable is driven by an engine, or other power, at a central station.

The tube may be of any desired shape, but it is preferable to make it cylindrical, and, since it can be placed in a less exposed and less traveled position than those used in the system for propelling cars, it need not be made of great strength. In cities it is proposed to construct the tube along the edge of the sidewalk, just outside of the curbstone, and to carry it around corners and deflect it where desired, so as to best accommodate the users of power. In this case the tube is made with an open top over which is placed a removable concave cover, which serves as a gutter to carry off surface water.

Is there a Snow Cap on Venus?

The planet Venus is now a morning star, and is a very brilliant object without the aid of the telescope. In the telescope it is a beautiful crescent. Its position is very favorable for telescopic observation. Taking advantage of this fact, our townsman, Isaac P. Guldenschuh, who has an excellent silver on glass reflecting telescope of seven inches aperture, reports an interesting discovery on the morning of the seventeenth of Aug., between three and four o'clock. Mr. Guldenschuh saw in profile on the convex edge of the crescent a brilliant white lenticular spot. This was cut out by a regular curve from the convexity of the crescent. The line of demarkation was sharply defined. He said he had seen nothing like it except the snow cap on Mars.

We suggested to him that in all probability he had seen a snow cap on Venus, although at the time we had seen no report of such an observation by any astronomer. This bright, lenticular spot cut into the broadest portion of the crescent, showing that, if it were a polar snow cap, the pole is now turned diagonally toward the sun. This was not very surprising, as the difficulties attending the determination of the axis of rotation are very great, and to this day the inclination of the axis of Venus to her orbit is not accurately known. It occurred to us that Mr. Guldenschuh may have hit upon a discovery of importance, and immediately consulted the authorities upon Venus. We found that the estimated inclination of the axis of rotation is not far from 75°, a fact which would fit the observation. Judging the present direction of the axis, from Mr. Guldenschuh's observation, and tracing the planet back to the time before inferior conjunction, it was seen that there must have been winter at the pole now visible before conjunction, and that summer is now approaching.

Upon consulting Webb's "Celestial Objects," we found in the appendix the following statement, which seemed to explain Mr. Guldenschuh's success: "Much attention has of late been paid to this planet, especially since the silvered reflector has been found peculiarly capable of defining it." In the same appendix it was learned that the bright spot had been seen by Browning on the 15th of March, 1868. It was on the circular limb, about 80 degrees from the south coast or horn. Browning described it as "so luminous as to show projection like the snow on Mars." This confirms the accuracy of Mr. Guldenschuh's independent observation. We are inclined to believe that both observers saw a polar snow cap. With the great inclination of the axis of Venus, one pole must be in darkness for six of Venus' months, and there is reason to believe that there is a great deposit of snow and ice during this period. If the inclination be 75 degrees, the tropics are but fifteen degrees from the pole. We trust that Venus will be carefully examined. Perchance the spot seen by Mr. Guldenschuh may be visible in the many refractors owned in this city.—*Rochester Democrat.*

THE NORTHEAST COAST OF NEW GUINEA.

The expected occupation of the great island of New Guinea, the near neighbor of Australia, by the British, lends interest to the following, which we find in the *Town and Country Journal*:

Travelers, such as Wallace, D'Albertis, and Moresby, the missionaries stationed for many years in the southeast part of New Guinea, and recent explorers from Europe as well as from Australia, have given descriptions of the more accessible portions of that island, but for some reason or other the opportunities which offered themselves for making drawings on the spot of the scenery and of the natives seem to have been but seldom taken advantage of, judging by the few sketches which have been published. Yet a sketch, even if it cannot claim the perfection of detail which distinguishes a photograph, will convey at a glance a better idea of the appearance of a country, its inhabitants, their dwellings, notions of dress, boats, and implements of war, than the most ample description from the pen. Talok Lindju, or Humboldt Bay, is situated nearly midway between the eastern and western extremities of the island, distant from each other about 1,600 English miles. The broadest part of New Guinea, more than 400 miles wide, abuts on Torres Straits in the south, and terminates on the shores of Humboldt Bay in the north. Hence, from its geographical position, its facilities of approach, good shelter, and more than sufficient space and depth for an anchorage, this bay will yet no doubt play an important part in the future colonization of New Guinea, which covers an area of over 300,000 square miles, equal to the total combined areas of the British Islands and France.

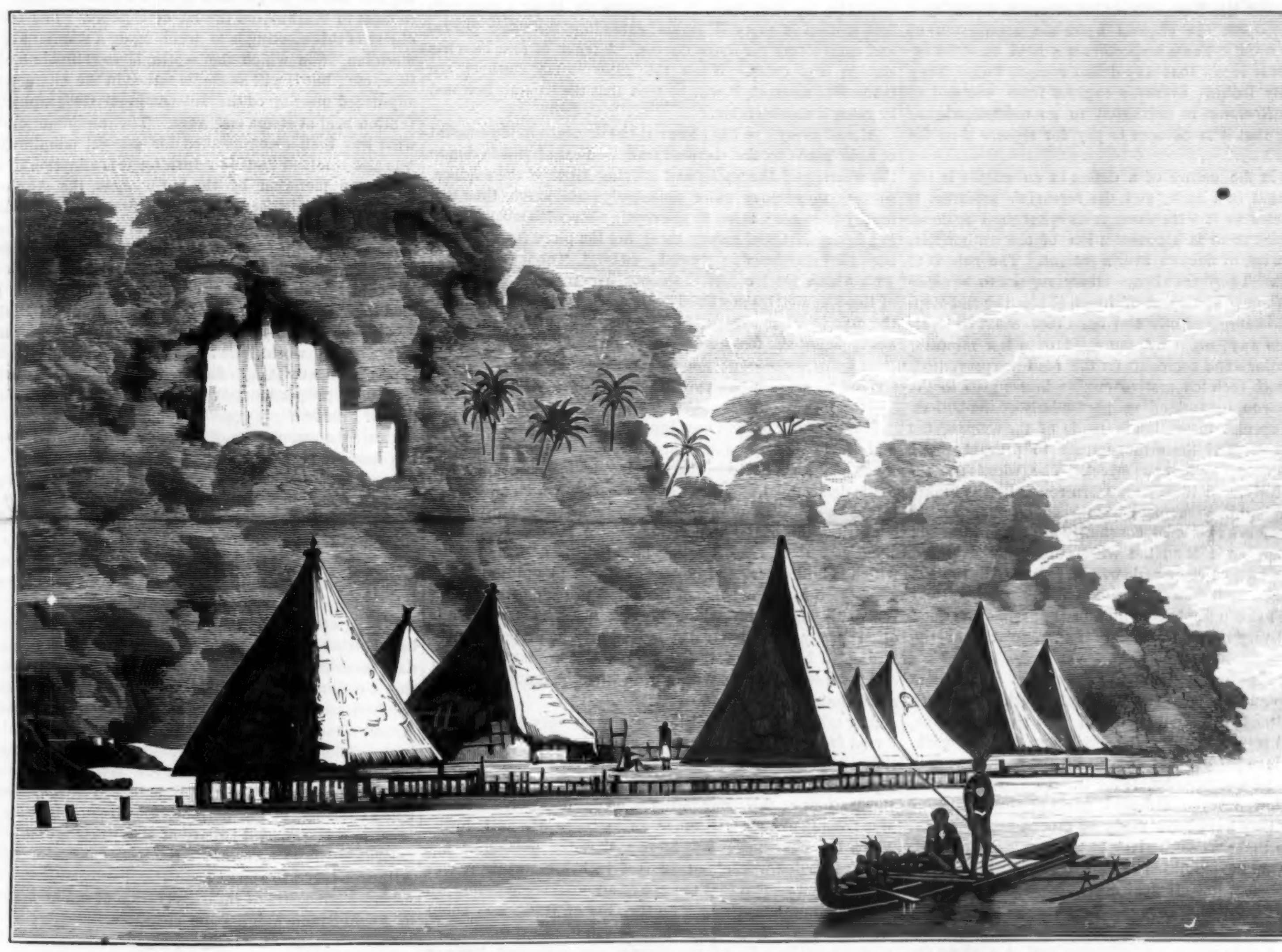
We may, perhaps, give a more vivid impression of the large extent of New Guinea by stating that a mail steamer, at its average rate of progress, will take from five to six days to steam from end to end of the island, that is to say, about the distance from Albany to Cape Otway, while its greatest breadth between Torres Straits and Humboldt Bay is nearly equal to the distance between Melbourne and Sydney, measured as the crow flies.

We present to our readers one of the sketches obtained in Humboldt Bay by a member of the Challenger expedition on the occasion of a visit, a few years back, to the northeastern coast of New Guinea, from whom the following account was obtained:

It was shortly after noon on a cloudy day of February that we first sighted the bold, rugged headlands which form the entrance to Humboldt Bay—Point Boupland to the east and Point Caille to the west. Owing to the great elevation of this part of the coast, the land appeared to be only five miles off, while in fact our distance was still twenty-five miles. On nearer approach, and as the weather cleared up, the lofty range and serrated peaks of Mount Cyclops, over 6,000 feet high, emerged from the clouds stretching westward as far as Point Dimonka, while eastward or to our left we could make out Mount Bougainville, both mountains covered with dense vegetation up to their summits. By placing these gigantic pillars on each side of Humboldt Bay, nature seems to have indicated the latter as the great gateway of New Guinea. Night had come on by the time we passed the entrance between the heads, here about a mile and a half apart, and anchored in 20 fathoms. New Guinea was discovered as early as the year 1537 by the Spanish navigator Grijalva. He describes the natives as men "with woolly hair; they eat human flesh, are great rascals, and given to such wickedness that the devils walk with them by way of companions."

In the year 1545 Tuigo Ostez de Hatez sailed along the greater portion of the north coast, landing at several places, and discovering a lot of new islands. It was during this expedition that the Spaniards gave to this great island the name of New Guinea, from the likeness of the natives to those of Guinea in Africa. In 1616 the Dutchman Schouten discovered Vulcan Island and the group of islands which still bear his name, situated on the northeast coast. He also visited the mainland, and according to his own account, "the natives had short and woolly hair; they wore rings in their nostrils and ears, feathers on the head, boars' tusks in their noses, and a large ornament on the chest. They chewed betel, and were subject to several diseases and deformities; they had plenty of cocoanuts, and asked one yard of cloth for four of these fruits; they owned pigs, but would not part with any." This description, although more than 250 years old, tallies word for word with the present condition of the natives.

In 1643 Tasman appeared on these coasts; Dampier visited the island in 1700, and his name remains attached to several localities. In 1705 the Dutch ship Geelvink explored the large bay in the northwest still called after it. In the year 1768 Bougainville discovered the land near Humboldt Bay, and in 1770 the celebrated navigator Cook surveyed part of the southern coast. After this date New Guinea was more frequently visited. In 1827 the subject of our illustration was discovered by Dumont d'Urville in command of the Astrolabe. He named Mount Bougainville, Humboldt Bay, and its two headlands, Point Caille and Point Boupland; but the loss of his anchors prevented him from completing his survey. Since his time the Dutch surveying ship the Etna in 1858, and H.M.S. Challenger in February, 1875, were the only vessels of note that anchored in Humboldt Bay. This will account for the little knowledge which the natives we met seemed to have of the ways and doings of white men, and the almost total absence of any traces, such as iron tools, of any previous interviews with the civilized world. An exploring party from Australia has for some time past been at work in New Guinea.



THE NORTHEAST COAST OF NEW GUINEA, NEAR HUMBOLDT BAY.

M. ANDRIES (*Ciel et Terre*) contends that hail is formed during ascending whirlwinds.

A Remarkable Surgical Operation.

Thomas Colt has recently been discharged from Bellevue Hospital, this city, with a restored nose. He was deprived of his nose a number of years ago by a cancerous affection technically called lupus, which destroyed the nasal bone as well as the fleshy covering, and even the lower eyelids. His treatment was undertaken over ten years ago by Dr. Thomas Sabine, the Professor of Anatomy of the College of Physicians and Surgeons, and has been successfully pursued up to the present time. Dr. Sabine first addressed himself to the task of arresting the disease, and when that was accomplished he restored the lost eyelids by grafting thereon healthy skin taken from the cheeks and forehead of the patient. The more difficult operation of restoring the nose followed. This was done by making use of the third finger of the left hand, from which the nail was first removed by nitric acid. Then the end of the finger was fixed against the forehead between the eyes, the epidermis at the points of contact having been previously removed to bring about adhesion. At the same time the finger up to the second joint was split open on the under side, the flesh stripped off, and the flaps thereby produced were connected with the flesh of the cheek on either side. The hand was fixed in the proper position by plaster of Paris, and held so until the adhesion was complete. Then the finger was amputated at the second joint, and the free edges of the part adhering to the face were arranged so as to form the wings of the nostrils. During all this time the nasal orifice was kept open by a hard rubber tube. The treatment necessarily occupied much time, and involved a number of painful operations, but was completely successful, and it is almost impossible now to distinguish the nose thus fashioned by surgical skill from one cast in Nature's own mould.

Tired Eyes.

People speak about their eyes being fatigued, meaning that the retina, or seeing portion of the brain, is fatigued, but such is not the case, as the retina hardly ever gets tired. The fatigue is in the inner and outer muscles attached to the eyeball and the muscle of accommodation, which surrounds the lens of the eye. When a near object is to be looked at, this muscle relaxes and allows the lens to thicken, increasing its refractive power. The inner and outer muscle to which I referred are used in covering the eye on the object to be looked at, the inner one being especially used when a near object is to be looked at. It is in the three muscles mentioned that the fatigue is felt, and relief is secured temporarily by closing the eyes or gazing at far distant objects. The usual indication of strain is a redness of the rim of the eyelid, betokening a congested state of the inner surface, accompanied with some pain. Rest is not the proper remedy for a fatigued eye, but the use of glasses of sufficient power to render unnecessary so much effort to accommodate the eye to vision.

Engines of the Elevated Railroads.

Although there are 220 boilers used by the elevated railroad companies of New York, which, through a peculiarity of law, are never officially inspected, there has never been a boiler explosion during the years the elevated railroad system has been in operation. During the same period there have been many disastrous explosions in and about the city of boilers which had been inspected and pronounced safe.

The reason why there have been no boiler explosions and few accidents to the machinery is that a rigorous system of inspection and repairs is kept up. The work is chiefly done in the big repair shop of the company, which covers two city blocks. It is one of the largest machine shops in the city, and employs 350 men. The master mechanic is T. W. Peeples, and the shop foreman J. D. Campbell. The shop is organized on the principle of an intelligent division of labor, thus securing for each portion of the work a body of well trained mechanics and a constant supply of duplicate parts of all machinery used. There are, for instance, three men constantly making and repairing connecting rods. If a connecting rod of an engine breaks, it is not necessary to wait to mend the broken rod or to make a new one. There is always one ready to be fitted in the place of the broken rod.

These shops are largely used for car and engine sheds. There is room for about 60 engines at a time. Every engine is not only carefully inspected by the engineer having it in charge, but there are two skilled mechanics employed to carefully inspect the engines upon the completion of every day's work. These inspectors are held to strict account, and it is rarely that any defect escapes them. They are constantly looking over the engines from one end to the other. Nothing is permitted to go unrepaired, the theory being that it is cheaper to pay for repairs than for accidents.

Anything in the nature of a defect in an engine is immediately noted in a book, and the foreman's attention is at once directed to it. He determines what shall be done. In knotty cases there is a consultation of the authorities, like that of a lot of doctors over a patient. The rule is to take no risks. There are always minor repairs to be made to engines in use. The strain of frequent starting and stopping keeps loosening screws and bolts that must be tightened. In this way, often by the work of a few minutes, serious detentions and accidents on the road are prevented.

Once a month each locomotive engine in use goes to the shop for a thorough overhauling, particularly of the boilers. At this time special inspection is made of the ashpan, the spark arresters, and the arrangements to prevent water or coal from dropping into the street. The wheels are examined carefully, and if they are worn rough by the brakes are taken off, and new surfaces are turned on them in big lathes. There are two men constantly attending these big lathes, and new surfaces on the wheels are made over and over again as long as the metal will warrant. All the car wheels are lined with paper and rimmed with steel. Great care is taken to keep the brakes in thorough repair, as upon them depend very much the safety and regularity of the trains.

After an engine has been in use two years it is taken into the shop and stripped for thorough overhauling, each part being attended to by experts in that particular line, who are held responsible for the efficiency of their work. The system is so perfect that any unskillful work is at once traced to the persons responsible for it. There are men who do nothing but put the different parts of the engine together after they have been made by others, and they are bound to see that the work given to them to use is properly done. They are not permitted to shift the responsibility upon their predecessors, but are held accountable as if they had done all the work themselves.

There are several patterns of engines in use on the road, and certain men in the shop are always kept at work on certain patterns. In this way each man becomes very expert in his special branch, and the various parts of the engines are constructed with great nicety. Each boiler, before it leaves the shop, is subjected to a hydrostatic pressure of 220 pounds to the square inch. All the boilers are made with extra plugs or manholes, so that they can be inspected much more easily and thoroughly than the boilers ordinarily in use on surface railroads. The iron used is the very best in the market, and often repairs are made when dictated only by extra precaution.

A very considerable expense of the big shop is the cost of water, of which immense quantities are used to fill the boilers, wash the cars, etc. The company has been engaged for months in sinking a big artesian well on the premises, which, it is hoped, will supply all the water needed.

Out of 220 engines belonging to the company there are generally about 15 in the shops in various stages of repair. One engine was built entirely in the shop, chiefly as an experiment. She is considered the best on the line, although made between times when repairs were not pressing.

Besides the constant inspection and repairs, the steam gauges are regularly tested and corrected once a month. The slightest variation is at once detected. It is only by such rigid and untiring watching of each screw and bolt and rivet that accidents are prevented. The tendency on all railroads is to "put a life" upon an engine—that is, to lay it up when its record shows that it has performed a fair average mileage. A record is kept of the mileage of each engine.

At the water stations there are hugh tanks, which are kept constantly filled by steam pumps. All this machinery is kept in order by the hands of the repair shop. All the tinware used on the road is made in the repair shop. The repairing of the cars requires a large force, and the supplies include a great variety of things. The breakage of glass chimneys to the lamps is a considerable item. The supply shop contains everything that can be imagined of the thousand and one odds and ends required to keep the cars and stations in repair.

In the principal offices of the shops there are curious records kept of the cars and engines belonging to the company. Each car or engine is represented by a button, which is dropped into one or another of a series of sections of holes in a neat board hanging on the wall. The sections are respectively labeled "good," "bad," "fair," "reserve," "repairing," so that at one glance at the board the foreman can tell the precise condition of the rolling stock and know where to concentrate his forces.

Not the least onerous part of the work of the master mechanic is the disposal of the swarm of inventors who are constantly applying to be heard. About one in a thousand has a good thing, and he finds a market at once. The railroad in the air has need for many appurtenances that are not used on other roads, and some of them are of entirely new construction. The gate on the car platforms is an instance. It grew out of the necessity for keeping passengers from jumping on the train when it is in motion. The twists in the road made it necessary to build a gate with free motion in every direction, extending for outer curves and contracting for inner curves. A train of four cars has sixteen iron gates. When the gates at the stations are taken into account, it will be seen that the capital invested in gates is considerable.

Almost every one has observed the decrease in the amount of noise made by the elevated trains. Part of this is due to the wearing of the tracks and moving parts of the engines, so that they move more noiselessly; but much time and money have been spent in the repair shop with noise subduing devices. Chief among these are the plans for suppressing the disagreeable "swish, swish," "chuck, chuck," with which the locomotive starts. The result is that many of the locomotives are fitted with a contrivance that arrests the noise, and distributes it into a sort of breathing that cannot be heard 100 feet away.—*New York Sun.*

How to Determine the Distance of an Object on the Sea.

It is amusing to note how ignorant many ordinary seamen and nearly all sea travelers are of such matters as the distance of the sea horizon, the way in which a ship's place at sea is determined, and other such matters—which all seamen might be expected to understand, and most persons of decent education might be expected to have learned something about at school. Ask a sailor how far off a ship may be, which is hull down, and he will give you an opinion based entirely on his knowledge of the ship's probable size, and on the distinctness with which he sees her. This opinion is often pretty near the truth; but it may be preposterously wrong if his idea of the ship's real size is very incorrect, and is sometimes quite wrong even when he knows her size somewhat accurately.

Any notion that the distance may be very precisely inferred from the relative position of the hull and the horizon line seems not to enter the average sailor's head. During my last journey across the Atlantic we had several curious illustrations of this. For instance, on one occasion a steamer was passing at such a distance as to be nearly hull down. From her character it was known that the portion of her hull concealed was about 12 feet in height, while it was equally well known that the eye of an observer standing on the saloon passenger's deck on the City of Rome was about 30 feet above the water level. A sailor, asked (by way of experiment) how far off the steamer was, answered, "Six or seven miles." "But she is nearly hull down," some one said to him. "I didn't say she warn't, as I knows on," was the quaint but stupid reply. Now, it might be supposed to be a generally known fact, that even as seen from the deck of one of the ordinary Atlantic steamers, the horizon is fully six miles away, the height of the eye being about 18 or 20 feet, and that for the concealed portion of the other ship's hull a distance of four or five miles more must be allowed; so that the man's mistake was a gross one. And several other cases of a similar kind occurred during my seven days' journey from Queenstown to New York.

The rules for determining the distances of objects at sea, when the height of the observer's eye and the height of the concealed part of the remote object above the sea level are both known, are exceedingly simple, and should be well known to all. Geometrically, the dip of the sea surface is eight inches for a mile, four times this for two miles, nine times this for three miles, and so forth; the amount being obtained by squaring the number of miles and taking so many times eight inches. But, in reality, we are concerned only with the optical depression, which is somewhat less, because the line of sight to the horizon is slightly curved (the concavity of the curve being turned downward). Instead of eight inches for a mile, the optical depression is about six inches at sea, where the real horizon can be observed. But, substituting six inches for eight, the rule is as above given.

Six inches being half a foot, we obtain the number of six inch lengths in the height of an observer's eye by doubling the number of feet in that height; the square root of this number of six inch lengths gives the number of miles in the distance of the sea horizon. Thus, suppose the eye of the observer 18 feet above the sea level; then we double 18, getting 36, the square root of which is 6; hence the horizon lies at a distance of six miles as seen from that elevation of 18 feet. For a height of 30 feet, which is about that of the eye of an observer on the best deck of the City of Rome, we double 30, getting 60, the square root of which is 7·7; hence, as seen from that deck the horizon lies at a distance of $7\frac{7}{10}$ miles. If the depth of the part of a distant ship's hull below the horizon is known, the distance of that ship *beyond the horizon* is obtained in the same way. Thus, suppose the depth of the part concealed to be 12 feet, then we take the square root of twice 12, or 24, giving 4·9, showing that that ship's distance beyond the horizon is $4\frac{9}{10}$ miles. Hence, if a ship is seen so far hull down, from the hull of the City of Rome, we infer that its distance is $4\frac{9}{10}$ miles beyond the distance of the horizon, which we have seen to be $7\frac{7}{10}$ miles —giving for that ship's distance $12\frac{3}{5}$ miles. And with like ease may all such cases be dealt with.—*R. A. Proctor, in Newcastle Weekly Chronicle.*

Metric vs. Anglo-Saxon Weights and Measures.

The International Institute for Preserving Anglo-Saxon Weights and Measures has addressed a memorial to President Arthur, asking him to appoint representatives favoring this side of the question to the International Convention to meet in Washington the 1st of October. The ostensible object of this meeting is to decide upon a standard or prime meridian, from which the world is to estimate longitude, time, etc., but it will assemble rather in the character of an adjourned meeting of the International Geographical Convention held at Rome last year. The meridian of Greenwich was then recommended for general adoption, but it was also resolved that, in return for this adoption of an Anglo-Saxon meridian by the Latin races, the Anglo-Saxon world, and particularly the United States, should adopt the French metric system. This, it is claimed by the Institute, is entirely uncalled for by the people, who have shown no discontent with their ancient system of weights and measures, but is mainly desired by a few thousand scientific gentlemen in this country, not engaged in practical affairs, although standing high in the several professions. The commerce of the world, however, its industry and its wealth, is predominantly Anglo-Saxon, and the business thereof is transacted proportionately in pints, pounds, and inches. If it took France forty years under an arbitrary government to cause the general use of the metric system, and overcome the confusion incident thereto, how much longer would it take, and how much greater the task, to transform all modern reckoning into this standard? The Sellers establishment adopted the metric system in their extensive machine works, and then abandoned it for the old system, after it had cost them an extensive plant. The American Society of Mechanical Engineers has also pronounced against this system by an overwhelming majority.

It is pointed out by the Institute that the metric system is based on erroneous calculations, the standards being essentially as arbitrary as those of the old system; and it is urged that a decimal arrangement can be easily effected with our Anglo-Saxon system, if that is desirable, without causing any serious disarrangement of present methods of reckoning. It is also claimed that the representatives already appointed by the President to the Convention are favorers of the metric system, President Barnard, a pronounced advocate thereof, being chairman of the delegation. From this fact, as also because it is supposed twenty of the thirty nations sending delegates will be favorers of the metric system, President Arthur is asked to appoint additional delegates who are pronounced advocates of the preservation of our ancient system of Anglo-Saxon weights and measures.

Production of Hydrogen Gas.

The *Revue Industrielle* describes an apparatus designed by M. Egasse for the generation, in large quantities, of hydrogen for industrial uses. For this purpose zinc scraps are placed in a copper cylinder closed by a hemispherical cover. Tubes connect the cylinders with the reservoirs of acid, and also with the gas washing appliance. Every cylinder is capable of producing 10 cubic meters of gas hourly, and what is called a "battery" of ten cylinders is mounted in a wagon for easy transport by two horses. The gas is produced in the classic manner, by the reaction of zinc and hydrochloric acid; and the acid is blown into the cylinders by compressed air, a special pedal blower being used for the purpose. The production of hydrogen by this method is very costly, for every cubic meter of gas requires 9 kilos. of acid and 3 kilos. of zinc, costing together 1·08 frs. Thus the price of hydrogen is from four to six times higher than that of coal gas; while even for ballooning purposes, for which it is specially suitable, its ascension value is scarcely double. The residual product of the manufacture of hydrogen by zinc and acid is crude chloride of zinc, which after concentration is marketable as a disinfectant or, in a purified form, as a mordant in dyeing. For this purpose, however, it requires so much preparation as to raise it into the rank of a primary manufacture, and the value of the finished product has very little bearing upon the first cost of its recovery as a residual of hydrogen gas production. It is not claimed by M. Egasse that the principle of manufacture here described is new, but that his apparatus is very compact and convenient.

DECISIONS RELATING TO PATENTS, TRADE MARKS, ETC.

United States Circuit Court.—Western District of Arkansas.

THE LIGGETT & MYERS TOBACCO COMPANY *vs.* HYNES.

Parker, J.:

The leading principle of the law of trade marks is that the honest, skillful, and industrious manufacturer or enterprising merchant who has brought into market an article which has found favor with the people, and who, by affixing to it some name or device to distinguish it as his and from all others, has furnished his guarantee of the quality and integrity of the manufacture, shall receive the first reward of his honesty, industry, skill, or enterprise.

Such a person is not in any manner or extent to be deprived of the right he has acquired by another who, to that end, applies to his own productions the same mark or a colorable imitation thereof.

In considering an alleged imitation of a trade mark, sight must not be lost of the character of the merchandise, the use to which it is put, the kind of people who ask for it, and the manner in which they usually order it.

If the article on which the alleged infringing mark is placed resembles another article bearing the trade mark that is claimed to have been infringed, so that this resemblance, when blended with the appearance of the device, has a tendency to deceive the ordinary public, then the very nature of the article becomes potential evidence in the case to show a purpose to deceive.

While there is no trade mark in the shape of complainant's plug of tobacco, yet when defendant makes plugs of the same general appearance and puts on them a device of such general resemblance to complainant's that the ordinary customer is deceived thereby, there is clear ground for an injunction.

United States Circuit Court.—Northern District of Illinois.

LYMAN *vs.* MAYPOLE *et al.*—PATENT TRAP FOR EXHAUST STEAM PIPES.

Blodgett, J.:

The law permits an inventor to construct a machine which he is engaged in studying upon and developing, and place it in friendly hands for the purpose of testing it and ascertaining whether it will perform the functions claimed for it; and if these machines are strictly experiments, made solely with a view to perfect the device, the right of the inventor remains unimpaired; but when an inventor puts his incomplete or experimental device upon the market, and sells it as a manufacturer more than two years before he applies for his patent, he gives to the public the device in the condition or stage of development in which he sells it. In such case his patent cannot be allowed to relate back, and cover forms which he gave to the public more than two years before he applied for a patent.

Letters Patent No. 179,581, granted July 4, 1876, to Wilfred C. Lyman, for an improvement in traps for exhaust steam pipes, construed, and *held* not to be infringed by a condenser head having an enlarged drain pipe instead of a hand hole, and not having inside cones with turned rims or edges.

United States Circuit Court.—Southern District of New York.

ROOSEVELT *vs.* WESTERN ELECTRIC COMPANY.—PATENT ELECTRIC BATTERY.

Wallace, J.:

The case made by the motion papers is this: The complainant's patent is for an improvement in electric batteries consisting of a prism and other elements, and the claims are for the prism and for various elements, in combination with it. The defendant is selling an electric battery which contains the prism, in combination with the several other elements which are covered by the claims of the patent, having purchased the prisms from complainant, but having obtained the other elements of the battery from other sources.

If it were true that the prisms are not capable of any use except in combination with the other elements covered by the several claims of the patent, the complainant can nevertheless insist that the purchaser should only be permitted to use them as substitutes for prisms which have been deteriorated or destroyed or to sell them to others. They could be used in this way without infringing the complainant's rights.

The purchase of a patented article from the patentee or owner of the patent confers upon the buyer the right to use the article to the same extent as though it were not the subject of a patent, but the sale does not impart the permission of the vender that it may be used in a way that will violate his exclusive property in another invention. When the article is of such peculiar characteristics that it cannot be dealt in as a trade commodity, and cannot be used practically at all unless as a part of another patented article of the vender's, it would be preposterous to suppose that the parties did not contemplate its use in that way. It would be against good conscience to allow an injunction to a vender under such circumstances. He would be estopped from asserting a right which the purchaser must have understood him to waive.

Upon the argument of the motion the case seemed to be like the one last stated, but it is not such a case.

The motion for an injunction is granted.

Vitiation of the Air by the Various Illuminants.

At a conference held in connection with the International Health Exhibition, in London, Mr. R. E. Crompton read a paper, in which he set forth the advantages of the electric light over other illuminants considered as a health question, which the *Sanitary Engineer* epitomizes as follows: He commences by pointing out the differences which exist between hours of work or recreation spent in daylight and under artificial light. The sunlight exercises a subtle influence on our bodies, and is necessary to enable all animal and vegetable organisms to flourish in the fullest conditions of healthful life. It furnishes heat as well as light, and these without vitiating the atmosphere. With artificial illuminants, on the other hand, we have light, but in insufficient quantities. Heat is also produced, which in proportion to the light afforded is enormously in excess of the heat given by sunlight. Artificial illuminants, with the exception of electricity, vitiate the atmosphere to a considerable extent.

The question is considered both in its relation to health generally, and also as our eyesight is affected. The various artificial lights differ very widely from sunlight in this respect, that they are all more or less deficient in the rays at the violet end of the spectrum, commonly called the actinic rays, and which most probably exercise a very powerful effect on the system. Even the light of the electric arc, which is richer in these rays than any other, is still on the yellow side of sunlight. The incandescent electric light is next best in this respect, after which come gas and oils.

To show the comparative heating and air vitiating properties of artificial lights, the following table, by Dr. Tidy, was given, to which has been added the heat produced by a 12 candle incandescent electric lamp:

Burnt to give light of 11 candles equal to 120 grains per hour.	Cubic Feet of Oxygen consumed.	Cubic Feet of Air consumed.	Cubic Feet of Carbonic Acid produced.	Cubic Feet of Air vitiated.	Heat produced in lb. of Water raised 10° F.
Cannel gas	3·30	16 50	2·01	217·50	105·0
Common gas	5·45	17·25	3·21	348·25	278·6
Sperm oil	4·75	23·75	3·33	356·75	233·5
Benzole	4.46	22·30	3·54	376·30	232·6
Paraffine	6·81	34·05	4·50	484·05	361·9
Camphene	6·65	33·25	4·77	510·25	325·1
Sperm candles	7·57	37·85	5·77	614·85	351·7
Wax "	8·41	42·05	5·90	632·25	383·1
Stearic "	8·82	44·10	6·25	669·10	374·7
Tallow "	12.00	60.00	8·73	933·00	505·4
Electric light	none.	none.	none.	none.	13·8

From these figures you will see that the air of a room lighted by gas is heated twenty times as much as if it were lighted to an equal extent by incandescent electric lamps. When arc lamps are used, the comparison is still more in favor of electricity. You will be surprised to see from the table, our old friend, the tallow candle, and even the wax candle, far worse than gas in the proportion of air vitiated and the heat produced; and you will be disposed to disbelieve it. But the fact is that, so long as candles were used, light was so expensive that we were obliged to be content with little of it; in fact, we lived in a state of semidarkness, and in this way we evaded the trouble. It is only since the general introduction of gas and petroleum that we have found what an evil it is.

It is not unusual, in fact, it is almost invariable, for us to find the upper stratum of air of the rooms in which we live heated to 120° after the gas has been lighted for a few hours. Looking again at the table, it will be seen that each gas burner that we use consumes more oxygen, and it gives off more carbonic acid, and otherwise unfits more air for breathing than one human being; and it is this excessive heating and air vitiation combined which are the main causes of injury to health from working long hours in artificial light.

Mention is made of some experiments conducting during the Birmingham Musical Festival. "The hall was lighted both by gas and electricity, the latter being in the form of clusters of lights placed on large brackets, projecting from the side walls, while the gas lighting was in the form of several large pendants suspended down the center of the hall. The candle power given by the electric light was about 50 per cent in excess of that given by the gas light. The degree of illumination by electricity was consequently very brilliant. It was found that when the gas was used, the temperature near the ceiling rose from 60° to 100° after three hours' lighting. The heating effect of the gas was, therefore, the same as if 4,230 persons had been added to the full audience and orchestra of 3,100. Similarly, the vitiation of the air by carbonic acid was equal to that given off by the breathing of 3,600 additional persons added to the above audience of 3,100. But on evenings when the electric light was used, the temperature only rose 1½° during a seven hours' trial; and the air, of course, was only vitiated by the breathing of the audience. Now we all of us know that the times when we suffer most from the effect of artificial light is in crowded places of public amusement which are at the same time brilliantly lighted. Many are unable to go to the theater, or attend evening performances of any kind, as the intense headache which invariably results through staying a single hour in such places entirely prevents us. This headache we commonly say is due to the heat and glare of the gas. Now this phrase is not strictly correct. It is no doubt due to the heat of the gas and its air vitiating properties; but when we use the word glare, I believe we refer to the effect the gas light has upon our heads, and which effect is not due to excess of light. On the contrary, I believe if a far greater amount of light be given by the electric light without the heating and air vitiation being present, such headache is never produced, although some of the more tender-hearted among us will at first complain of the glare because we are habituated to associate with plenty of light, great heat, great air vitiation, and other evils."

Speaking of the effects of artificial lights on the eyesight, he said that healthy eyesight demands a plentiful supply of light. "It is the greatest mistake to suppose that a state of semidarkness is good for our eyes, unless they are defective or recovering from the effects of past injury or disease. I think I have the authority of oculists when I say that nineteen-twentieths of the diseases of the eye arise from working long hours with insufficient light. Again, another great cause of injury to eyesight is the unsteadiness of most artificial lights."

Referring to the arc and incandescent electric lamps, he said both had their proper places. The arc light, which is whitest in color and most economical to produce, is not so steady as the incandescent lamp. It is therefore unsuitable for indoor use where a maximum of steadiness is required; but it is well suited for the lighting of large buildings and public places.

Hibernation of Reptiles.

Charles C. Abbott, writing in *Science*, asserts that the hibernation of reptiles varies much according to the severity of the winter. Many turtles take refuge in the deep holes of ponds, and Doctor Abbott asserts that, in the severest cold weather, he has caught the snapping turtle, the musk turtle, and the box mud turtle in deep holes and about large springs that discharge their waters on level ground.

As fish have been found partly eaten when taken in nets in mid-winter, Doctor Abbott concludes that the snapper takes an occasional meal. At the same time, he does not deny that the species found active in winter hibernate under certain conditions, and that the other species of turtle hibernate.

Snakes which live in water do not sleep so deep a winter sleep as do the black snake and others which frequent the uplands.

The true water snake (*Tropidonotus sipedon*) may often be found in winter a foot or two beneath the sand of any spring hole, and is not slow to swim off when thus disturbed. This species and the common garter snake are the first to appear in the spring.

The upland snakes may be literally broken into pieces without giving evidence of life, so thoroughly torpid are they.

Toads and tree frogs, terrestrial and arboreal animals, are more sensitive to cold than the water living frogs and salamanders.

Frogs at the commencement of winter retreat to the bottoms of ponds and deep ditches; salamanders, to the mud at the bottom of springs.

All the kinds of frogs and three species of salamanders have been found in a hogshead sunk in the ground to collect the waters of a spring. They were sluggish, but not actually hibernating.

Border Carnations.

J. Douglas, in *The Garden*, states this beautiful plant may be grown in any garden in town or country without any further preparation of the soil than digging it well up and giving it a good dressing of stable manure. All soils are not, however, equally well adapted for carnations. If they incline to be of a clayey character, so much the better. Light, sandy soils with a gravelly foundation are the least suited for carnation culture. I have, however, grown them well on such soils by digging or trenching them and placing a good layer of manure in the bottom of the trench. When the plants were put out, they were also placed in a layer of loam about two inches deep spread over the surface. Soil from a melon bed just suits carnations; in fact, we generally utilize the soil that has grown one class of plants for the production of another class.

This year we wanted to put out several hundreds of seedling carnations, and as the ground is of a clayey character, the light, sandy soil from pots in which hyacinths had grown was used to place on the surface instead of melon soil, which is heavy. Last year I planted in an ordinary herbaceous border some of our best carnations and picotees, and they flowered remarkably well without any attention, except that of the most ordinary kind. Florists of old could not grow their flowers so well as we do now, although they took more pains to make up their carnation beds than some people do to make a vine border. There are very few carnations or picotees that require coddling up in the greenhouse. We grow them in pots to obtain purer and better flowers for exhibition or to produce an effect in the greenhouse, but in any good garden the same plants flower freely and produce useful flowers to cut for bouquets.

How to Expedite Topography.

The writer has found it quite a tedious job transferring the contours, water courses, etc , from the topography book to the plate of the preliminary survey by the usual method.

Now, if the transitman will place the preliminary on tracing cloth to the same scale as the rulings in the topography book, the topographer can place the line and stations of the plate over the corresponding lines and stations in his book, and trace his work on to the plate in a few minutes, as the writer has found by actual trial while working with a B. and M. locating party. "TOPOG."

The Purification of Water by Iron.

BY W. ANDERSON, M.INST.C.E.

In January, 1883, in a paper on the Antwerp Waterworks, read at the Institution of Civil Engineers, I described the application of Professor Bischof's method of filtration, through a mixture of spongy iron and gravel, to the purification of the waters of the river Nethe. The eighteen months' additional experience gained has shown that, so far as the purification of the water is concerned, Professor Bischof's process leaves little to be desired, but the working of the system has been costly, and the area of land required, as well as the quantity of iron necessary, has, in the case of the Antwerp water at any rate, proved very much beyond the inventor's expectations.

The increased demands of the town rendered it necessary to extend the arrangements for purifying the water, and it became my duty to advise the directors of the company on the best means of doing this.

The extension of Professor Bischof's method would have involved so great an outlay, that after trying, unsuccessfully, many experiments on direct filtration through unmixed iron at high rates of flow, I determined to adopt a plan first suggested to me, some years ago, by our chairman, Sir Frederick Abel, of agitating the water to be purified with iron instead of attempting to filter it. The object, in either case, was to expose the water as much as possible to an extended surface of iron; consequently any plan by which the iron could be made to keep itself clean by rubbing against itself continually, would seem to be a more rational way of attaining this object than of trusting to a partial filtration through a more or less spongy material.

The obstacle to trying Sir Frederick Abel's method at a much earlier date was the belief entertained by Professor Bischof that a contact of about 45 minutes was necessary to insure complete purification, and any such time would be fatal to mechanical means of performing the work. The late Professor Way and Mr. Ogston, it is true, had shown that with very finely divided iron the effect was much more rapid, but there was still a doubt about its permanence.

In the autumn of last year a revolving cylinder, 4 feet 6 inches in diameter and 5 feet 6 inches long, was adapted to try Sir Frederick Abel's system. It was fitted with inlet and outlet pipes, and with shelves or ledges for scooping up the iron, raising it to the top of the cylinder, and then letting it fall through the water.

At first I began to run water through at 12 gallons per minute, which gave a contact of about 45 minutes, but I found that at this rate the water was very heavily charged with iron; I gradually increased the quantity to 30 gallons per minute, and then found that 1·20 grains of iron were dissolved per gallon, or about twelve times more than experience at Antwerp showed to be necessary. The flow was increased to 60 gallons, and even then 0·9 grain per gallon were dissolved.

The experiment looked so hopeful that I fitted much larger pipes to the apparatus, and having made some other dispositions connected with maintaining a uniform distribution of iron in the cylinder, and preventing it being washed away by the comparatively rapid current that would be possible, I sent the "revolver," as it came to be called, to Antwerp, where it was put to work at the end of last February, and has continued to operate ever since.

The head available for forcing the water through the "revolver" is, at Antwerp, limited to 5 feet, but by fitting very large pipes I have managed to get 166 gallons per minute through; this gives a contact of about 3½ minutes, and is so amply sufficient that I feel sure that, even for the waters of the Nethe, much less time will be adequate.

The charge of iron is about 500 pounds, and the quantity taken up by the water, including impurities and very fine iron washed away, during a run of 33 days, was 0·176 grain per gallon.

By making suitable arrangements, and choosing a favorable time with respect to the demands of the town, we were able to obtain samples of water that have been purified by the "revolver" only, and after proper exposure to the air, followed by filtration through one of the large sand filters, the result obtained has been that the color was very little different from distilled water, the free ammonia was reduced from 0·032 grain per gallon to 0·001, and the albuminoid ammonia from 0·013 grain to 0·0045.

The "revolver" turns at the rate of about one-third revolution per minute, and requires scarcely appreciable power. The area occupied by apparatus for dealing with 2,000,000 gallons per day is 29 feet by 24 feet, and it can be introduced into any existing system of filters, for by enlarging the in and out let pipes to a suitable diameter, a head of some 12 inches will suffice to pass the water through.

It can easily be arranged so as to be used or not, as the state of the water to be purified may warrant; and the consumption of iron being only about 20 pounds per million gallons, is quite an insignificant expense. It will be found to remove all color from water, whether caused by peat or clay, and will facilitate the action of sand filters by the peculiar curdling effect the iron has on the impurities.

During the experiments made at Erith, it was noticed that considerable quantities of gas collected in the upper part of the "revolver." On collecting this gas it was found to extinguish a lighted taper instantly, and on analysis was found to contain only 8 per cent of oxygen.

It was observed from the first that the animal and vegetable life which was so abundant and troublesome in the natural waters of the Nethe, lying over the spongy iron filters, had quite disappeared in the water, otherwise in exactly the same circumstances, lying over the sand filters, and I always supposed that this was due chiefly to mechanical filtration through the spongy iron having separated all the germs, spores, and seeds which come to life above it. But during the recent hot weather it has been found that the water from the "revolver," though it contains all the impurities of the natural water, has been modified by the action of iron to such an extent that neither animal nor vegetable life is apparent over the sand filters. Without presuming to draw very wide inferences from this fact with reference to the action of iron upon organisms connected with disease, it may, at least, be pointed out that the absence of visible life in water treated by iron on a large scale confirms, in a great measure, the experiments of Dr. Frankland, Dr. Voelcker, Mr. Hatton, Professor Bischof, and others. It is due to the last named gentleman to state that to his persistent advocacy the introduction of iron as a purifier is mainly due. It must be borne in mind that the system does not depend on filtration only, but, first, on a process of exposure to iron, which decomposes the organic matter, and kills living organisms; and, secondly, on simple filtration, which merely separates the noxious matters which had been previously attacked by the iron. The waters of the Nethe are exceptionally bad, and heavily charged with impurities, so that the test both of Professor Bischof's and Sir Frederick Abel's systems has been very severe.—*Jour. Soc. Arts.*

Purification of Water by Iron at St. Louis.

Mr. L. H. Gardner, Secretary of the New Orleans Waterworks Company, has invented a method of clarifying river water. His description of it is as follows: "It has long been known that iron in all its forms, from ordinary scrap iron up to the various solutions of iron known to chemists, will clarify water. The trouble has been to give a clear water result and at the same time to eliminate from that result every feature that the investigation of the chemist or that every day use could criticise. I have used a solution of iron, the result of empirical experiments, the use of which does not develop any objectionable feature or characteristic whatever. It precipitates matter held in suspension in the water, and goes with it to the bottom of the tank or basin. The water thus clarified presents no feature or characteristic it did not possess before, except its crystalline appearance.

"St. Louis has very large settling basins, four in number, with an aggregate capacity of some 70,000,000 of gallons. Our reservoir has also four basins, but their total capacity is less than 4,000,000 gallons. I wanted to test my method upon the largest scale possible. To this end I consulted Col. T. J. Whitman, the water commissioner of St. Louis, a disciple of Kirkwood, and one of the most eminent engineers and waterworks men in the country. His interest in the matter led him to invite me to St. Louis, and to tender me the use of one of his settling basins for the purpose of exemplification on a large scale.

"The basin assigned me could not be drawn entirely clear of water. It contained, on its delivery, about 3,250,000 gallons of muddy water. To this we added over 9,500,000, making a total of over 12,750,000 gallons.

"It required six hours of steady pumping by the ponderous machinery of the St. Louis works to accomplish this, lasting from 9 A.M. to 3 P.M. We had not been at work much more than an hour before the water at the further end of the basin, 600 feet distant from the inflow, could have been delivered in a much clearer condition than the average city supply. Three hours after the pumps ceased work on our basin the water presented a contrast to that in the contiguous basins which was highly complimented by the mayor of St. Louis, by the water commissioner, his assistant, and others who witnessed it. At sunrise next morning the water was clear as crystal.

"The solution of iron was poured from a pitcher by a man standing over the supply pipe in a porportion which had been calculated of one-quarter of a pound of the solution to 8,500 pounds, or 1,000 gallons of water. 'You see,' added Mr. Gardner, 'that the proportion is practically infinitesimal, and even strychnine in such a dilution would be, I imagine, harmless.'

"There now remains the investigation of the chemist and his comparative qualitative and quantitative analysis. This has been promptly entered upon. If intelligently conducted, as I have no doubt it will be, I have no doubt of a favorable report. This, in the mind of Col. Whitman, the water commissioner, seemed to be the only thing needed to demonstrate the entire success of the system. The cost of this method is anywhere from three-quarters of a cent to a cent and a quarter per 1,000 gallons. The cheapest method of *filtration* in the United States, so far as I know, is over three cents per 1,000 gallons, and this with irregular results."

Mr. Gardner showed some of the water clarified here by this process, which had been kept in a five gallon demijohn since 1883. It was in perfect condition, clear as crystal, pure, and sweet to the taste. That water has been analyzed by Dr. Joseph Jones, Professor R. N. Girling, and Professor C. F. Chandler of New York, who have pronounced it pure and potable.

M. TROUVELOT, of the Observatory of Meudon, after observing the shadows thrown by the faculæ on the penumbræ of sun spots, suggests that the brilliant light emitted by the faculæ, and perhaps the entire light of the sun, is generated at its surface, the presence of the coronal atmosphere being, perhaps, necessary for its production.

The Great Atlantic Steamships.

The Cunard steamer Oregon concluded on Saturday, August 23, the fastest ocean trip from Queenstown to New York yet made, making the passage in six days and ten hours, and beating her own former record. The distance run each day was as follows:

	Knots.
Monday	400
Tuesday	452
Wednesday	436
Thursday	452
Friday	448
Saturday	449
To Sandy Hook	181
Total	2,818

The two new large steamships now building for the Cunard Line, to sail on their Atlantic route between Liverpool, Boston, and New York, will come out here next spring. One of them, the Umbria, was launched last June, and the other, the Etruria, will soon follow. Both of these vessels are intended for what is called among steamship men fast vessels, *i. e.*, "express steamers," and the highest naval constructing and engineering talent has been employed in their design and construction. They are built of steel, and their hulls subdivided in watertight compartments, to conform with the requirements of the British Admiralty, which feature in itself means the maximum degree of safety at sea. These vessels are the largest steamships that have ever been built on the Clyde. As can be seen in the following table, these new Cunarders are both shorter and deeper (proportionately) than the City of Rome and other steamships built lately, besides being (proportionately) wider. They will be engined to develop the enormous power of 12,500 horses, which, as Mr. Pearce, their builder, stated at the launch of the Umbria, will make them the most powerful steam craft in the world. How much they may lower the record of passages across the Atlantic is, of course, a matter of conjecture. The following table shows the comparative size and power of some of the leading steamers now running on the Atlantic:

Vessels.	Length between Perpendiculars. Feet.	Extreme Width. Feet.	Depth of Hold. Feet.	Indicated H. P.	Gross Tonnage.
Alaska	500	50	38	11,000	6,932
America	442	51·2	36	7 500	5,528
Arizona	450	45·4	35·7	7,400	5,164
Aurania	470	57·2	37·2	9,500	7,269
Austral	456	48·2	33·9	7,000	5,589
City of Rome	560	52·3	37	10,000	8,144
City of Berlin	489	44·2	34·9	6,000	5,491
City of Chicago	481	45	34·6	6,600	5,202
Furnessia	445	44·8	34·5	5,500	5,495
Germanic and Britannic	445	45·2	33·7	7,000	5,008
Servia	515	52·1	37	8,500	7,392
Oregon	501	54·2	38	11,500	7,375
Umbria and Etruria	505	57	40	12,500	8,000

The Importation of Rags.

The extended use of wood pulp for paper making has not greatly reduced the demand for rags, although it has made their price permanently lower. All good book and writing paper, as well as that used for printing fine periodicals, should be made all or largely of rags, and, to get the supplies needed in this trade, paper makers annually import considerable of such stock, the imports last year reaching 84,000 tons. Fear of the cholera, however, recently caused the Treasury department to prohibit all importations of rags for ninety days from Sept. 1. This order was subsequently modified so as to admit rags now on the way here, where it was certainly proved that they were collected from non-infected districts, but that no rags shipped after the date of the order would be admitted. The matter has caused considerable excitement among paper manufacturers, some of whom had been at considerable expense in erecting and conducting rag washing and disinfecting establishments at Cairo and Alexandria, in Egypt, whence a large portion of the rags imported come. There is said to be a strong feeling in Congress in favor of absolutely prohibiting the importation of rags; this the paper manufacturers claim would be most unfair to their industry, and they assert that, under the present system of inspection, imported rags are no more dangerous than the domestic.

Glue, Paste, or Mucilage.

Lehner publishes the following formula for making a liquid paste or glue from starch and acid. Place five pounds of potato starch in six pounds of water, and add one-quarter pound of pure nitric acid. Keep it in a warm place, stirring frequently for forty-eight hours. Then boil the mixture until it forms a thick and translucent substance. Dilute with water, if necessary, and filter through a thick cloth. At the same time another paste is made from sugar and gum arabic. Dissolve five pounds gum arabic and one pound of sugar in five pounds of water, and add one ounce of nitric acid and heat to boiling. Then mix the above with the starch paste. The resultant paste is liquid, does not mould, and dries on paper with a gloss. It is useful for labels, wrappers, and fine bookbinder's use. Dry pocket glue is made from twelve parts of glue and five parts of sugar. The glue is boiled until entirely dissolved, the sugar dissolved in the hot glue, and the mass evaporated until it hardens on cooling. The hard substance dissolves rapidly in lukewarm water, and is an excellent glue for use on paper. —*Polytech. Notiz.; Pharm. Record.*

ENGINEERING INVENTIONS.

A car coupling has been patented by Mr. William T. Quinley, of Golden Lake, Ark. It consists of combined pin and link holders, which may be set independently of each other, for coupling cars automatically, the ordinary pin and link being used.

A steam throttle valve has been patented by Mr. Augustus H. Morrison, of Mechanicsville, N. Y. It is for automatically regulating the flow of steam where, in a given operation or need, a varying amount is required, and the amount required controlling the operation of the valve, for which novel devices are provided.

A steam whistle has been patented by Mr. John Einig, of Jacksonville, Fla. The improvement consists of an extension contrivance of the lower end of the bell, to enable it to be shifted nearer to or farther from the nozzle to adapt it to high or low steam in the adjusting of the whistle for producing sounds most agreeable to the ear.

A car coupling has been patented by Mr. George J. Selleck, Jr., of Beetown, Wis. A lever is pivoted in the slot of the drawhead, a coupling pin being pivoted to the free end of the lever, and a lever is pivoted in the bottom of the drawhead, having its inner end weighted, the outer or front end being slotted, so that when the link is in the drawhead the coupling pin passes through the link and through the slotted end of the weighted lever, and is thus held in place.

A steam engine has been patented by Mr. Anthony Bollinger, of Zanesville, O. It has special constructions of piston, with separate steam and exhaust chambers, communicating with the steam inlet and exhaust pipes, the pipes or tubes being arranged to move with the piston and telescope the steam supply pipe; there is also a special arrangement of the valves and means for tripping them, the object being to make a simple and durable engine, which may be readily reversed, is easily operated, and economical in the use of steam.

MECHANICAL INVENTIONS.

A journal bearing has been patented by Mr. James M. Elliott, of Winnsborough, S. C. The cap of the journal box has an adjustable bearing block, and is provided with adjusting screws for setting it down on the journal; also with an adjusting screw and bearing faces for controlling the block laterally, the cap being permanently bolted down on the box.

A shingle machine has been patented by Mr. Charles A. Tarragon, of Portland, Oregon. It is made with sills having rails carrying rack bars with wheels, connected by a crossbar with each other, and engaging with gear wheels fixed to a shaft, so the rack bars are made to move forward and back evenly, spring pressed knives tapering the shingles according to tapered gauge bars, with other novel features.

A regulator for paper drying machines has been patented by Mr. Augustus H. Morrison, of Mechanicsville, N. Y. The invention consists in journaling one of the top rollers in one arm of a three armed lever, to another arm of which is attached a rod and tension spring, while to the opposite arm is connected the handle of a steam valve for regulating the supply of steam to the drying cylinders; there is also a bell for giving alarm if the web of paper breaks, with other novel features.

AGRICULTURAL INVENTIONS.

A harrow attachment for plows has been patented by Mr. Enoch C. Calvin, of Pinckneyville, Ill. An obtuse angled bar carrying teeth on its outer arm is so combined with a turn plow, another bar bent at both ends having teeth adapted to work rearwardly, as to form a harrow rigidly attached to the plow beam, to pulverize and level the soil, cutting down the high parts of the furrow slice and filling the low places.

A combined roller and seed planter has been patented by Mr. Julius F. Muenchow, of Plainview, Iowa. The rollers have their axles connected with the platform of the machine by a king bolt, the opening plows have standards with screw threads, and attached to the platform of the machine are seed boxes with discharge spouts, closed at their lower ends by valves operated by springs.

A fleece binder has been patented by Mr. Theodore C. H. Krueger, of Brady, Texas. It is constructed with a box attached to a supporting frame, and having inclined flanges upon its side edges, with hinged press boards and fingers operated by push bars, a cord, and a treadle, so the fleece can be compressed and held while being tied, a knife being so attached that all the twines of the bundle can be cut at a time.

MISCELLANEOUS INVENTIONS.

A jar and fastening therefor has been patented by Mr. Herman Pietsch, of Flatbush, N. Y. The jar has flanges near its mouth, and the cover has grooves and a clamp, with hooks, a lug projecting outward on one hook for being grasped to spring that end of the clamp free in opening the jar.

A rubber spring has been patented by Mr. Frank E. Flagg, of New York city. It is made of rubber cord, with the ends wound and metallic ferrules placed thereon, the latter provided with connecting devices for holding the spring in place, making a simple and durable spring for icemen's rubber aprons, door bands, cage hangers, etc.

A water tight glove has been patented by Pauline W. A. Petersen, of Brooklyn, N. Y. It is made of waterproof canvas, leather, or rubber, with the tips of the fingers, the thumb, and palm provided with projections or ribs, so the thickness and strength of these parts are increased, and the friction surface of the glove enlarged.

A railway ticket has been patented by Mr. Charles J. Knapp, of Deposit, N. Y. This invention provides a specially devised coupon book for "thousand mile" railway tickets, to promote convenience in their taking up or punching, and to enable the holder to easily verify the mileage punched out by the conductor.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

Name and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or mail, each must take his turn.
Special Information requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter**, should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Minerals sent for examination should be distinctly marked or labeled.

(1) W. H. S. H. asks (1) how Thorley's food is made. A. We do not know the composition of Thorley's food. It is a medicinal preparation, and in order to determine its constituents, it will be necessary to have it analyzed by some competent chemist or pharmacist. 2. How to make bluing? A. For bluing take 1 ounce of soft Prussian blue, powder it and put in a bottle with 1 quart of clear rain water, and add a quarter of an ounce of oxalic acid. A teaspoonful is sufficient for a large washing. 3. How to soften water. A. Hard water contains more or less calcium carbonate. The addition of lime will make it soft. See description of the process used in England on page 4306 of SCIENTIFIC AMERICAN SUPPLEMENT, No. 270. 4. How the different kinds of ink are made. A. SCIENTIFIC AMERICAN SUPPLEMENT, No. 157, gives numerous receipts for all kinds of ink.

(2) J. W. asks: 1. What would be the effect on coal gas to heat it just before it came to the burner? A. The effect of heating on the gas alone with an ordinary burner would not be beneficial for illumination? 2. Do you know of a flat flame tip that has been patented that does it? A. No.

(3) A. H. asks how to take smoke stains out of marble caused by the building being partially burned. A. We recommend the following: Take 1 oz. of ox gall, 1 gill of lye, 1½ tablespoonfuls of turpentine; mix, and make into a paste with pipe clay. Apply the paste to the spots, and allow it to remain over them for several days. Or take 2 parts of common soda, 1 part of pumice stone, and 1 part of finely powdered chalk, sift it through a fine sieve, and mix it with water, then rub it well over the marble and then wash the marble off with soap and water.

(4) F. H. S. says: My boy 20 months old is beginning to talk, and stutters terribly. What remedy can I use? A. No medicines will be of any service, but you should have the child examined by some good physician. Stuttering in children is often caused by something abnormal in the mouth or throat; cleft palate for instance, elongated or diseased uvula, a tumor at some point, etc. It is also caused by hearing some one else stutter; the remedy for this is of course to keep him away from the influence. If neither of these causes exist, you must wait; nothing can be really done to break the habit before the child is six to seven years old.

(5) J. F. B. asks: What parts of glue and glycerine mixed together will give me a thin substance that, after drying, can be bent or doubled without cracking or breaking? A. You will have to use a composition similar to printers' rollers. An average composition consists of Cooper's best glue, 8½ lb.; extra sirup, 2 gal.; glycerine, 1 pint; Venice turpentine, 2 oz. Steep the glue in rain water until pliant, and then drain it well. Next melt it over a moderate fire, but do not "cook" it. This will take from 15 to 25 minutes. Then put in the sirup or molasses and boil three-quarters of an hour, stirring it occasionally and skimming off impurities rising to the surface. Add the glycerine and turpentine a few minutes before removing from the fire, and pour slowly. Slightly reduce or increase the glue as the weather becomes colder or warmer.

(6) L. W. asks 1. For the process for cleaning and curing tripe from the slaughter house to the market. A. In New York it is partially parboiled, but in some other places only washed with cold water before sent to market; it is generally cured by pickling in hot vinegar and spices, after cooking. 2. How is bay rum made? A. A cheap bay rum can be prepared by saturating a quarter pound block of magnesium carbonate with oil of bay; pulverize the magnesia, place it in a filter, and pour water through it until the desired quantity is obtained, then add alcohol. The quantity of water and of alcohol depends on the desired strength and quantity of bay rum. 3. What are a few of the best muscle and blood producing kinds of food? A. The question of nutritive foods is discussed elaborately in SCIENTIFIC AMERICAN SUPPLEMENT 186, under the title of "Food Physiology and Force," and in SCIENTIFIC AMERICAN SUPPLEMENT 124, as "Cost and Nutritive Value of Foods." 4. Are wild meat and game better than domestic? A. Not necessarily.

(7) F. A. N. asks: 1. How would you go to work to put a good finish on a piece of black walnut wood with white wax or paraffine to take the place of varnish or shellac? What would you use to cut the wax to get it in a liquid state, and what proportion to mix it. Also what to color it with, so it would not show white in the pores of the wood? A. Wax and paraffine are both soluble in benzine or naphtha. You can make it of any desired thickness by using more or less naphtha. You can color with burnt umber or with asphaltum. 2. Also how to polish floors with beeswax? A. To prepare wax for polishing floors, 12½ pounds of yellow wax rasped are stirred into a hot solution of 6 pounds of good pearl ash in rain water. Keeping the mixture well stirred while boiling, it is first quiet, but soon commences to froth; and when the effervescence ceases heat is stopped, and there are added to the mixture while stirring 6 pounds of dry yellow ocher. It may then be poured into tin cans or boxes, and hardens on cooling; when wanted for use a pound of it is diffused in 5 pints of boiling hot water, and the mixture, well stirred, is applied while still hot to the floor by means of a paint brush; it dries in a few hours, after which the floor is to be polished with a large floor brush, and afterward wiped with a coarse woolen cloth. It is said that a coat will last six months.

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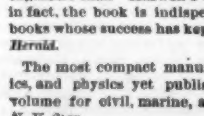

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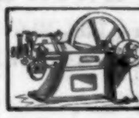

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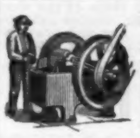

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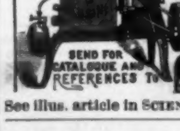

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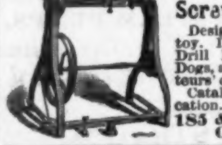

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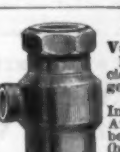

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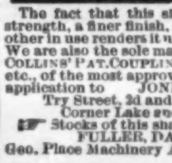

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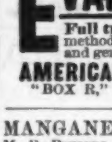

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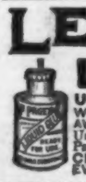

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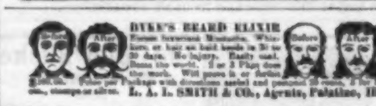

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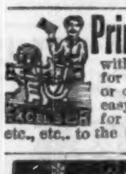

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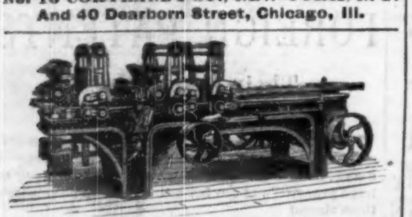

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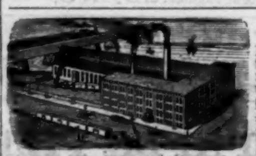

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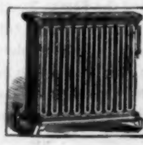

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